

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc. Botany

(Choice Based Credit System)

(With effect from the academic year 2017-2018 onwards)

Sem	Pt	Sub No	Subject Status	Subject Title	Con Tact Hrs/wk	L Hrs/wk	P Hrs/wk	Credits
I	I	1	Language	Tamil/Other Languages	6	6	0	4
	II	2	Language	English	6	6	0	4
	III	3	Core – Paper I	Plant Anatomy & Microtechniques	4	4	0	4
	III	4	Core – Paper II	Algae & Bryophytes	4	4	0	4
	III	5	Major Practical I	Plant Anatomy, Microtechniques, Algae & Bryophytes	2	0	2	2
	III	6	Allied I Paper – 1	Plant Diversity and Medicinal Botany	4	4	0	3
	III	7	Allied Practical-1		2	0	2	2
	IV	8	Common	Environmental Studies	2	2	0	2
				Subtotal	30	26	4	25
II	I	9	Language	Tamil/Other Languages	6	6	0	4
	II	10	Language	English	6	6	0	4
	III	11	Core – Paper III	Fungi, Plant Pathology and Lichenology	4	4	0	4
	III	12	Core – Paper IV	Cell Biology & Embryology of Angiosperms	4	4	0	4
	III	13	Major Practical 2	Fungi, Plant Pathology, Lichenology, Cell Biology & Embryology of Angiosperms	2	0	2	2
	III	14	Allied I Paper – II	Embryology, Plant anatomy, Physiology and Biotechnology	4	4	0	3
	III	15	Allied Practical-2		2	0	2	2
	IV	16	Common	Social Value Education	2	2	0	2
				Subtotal	30	26	4	25
III	I	17	Language	Tamil/Other Languages	6	6	0	4
	II	18	Language	English	6	6	0	4
	III	19	Core – Paper V	Pteridophytes, Gymnosperms & Paleobotany	4	4	0	4
	III	20	Major Practical 3	Pteridophytes, Gymnosperms & Paleobotany	2	0	2	2
	III	21	Allied - II		4	4	0	3
	III	22	Allied Practical II		2	0	2	2

	III	23	Skilled Based Core	Mushroom Cultivation/Preservation of Fruits and Vegetables	4	4	0	4
	IV	24	Non-Major Elective	Gardening and Garden Management/ Herbal Medicine	2	2	0	2
				Subtotal	30	26	4	25
IV	I	25	Language	Tamil/Other Languages	6	6	0	4
	II	26	Language	English	6	6	0	4
	III	27	Core – Paper VI	Microbiology & Techniques in Biology	4	4	0	4
	III	28	Major Practical 4	Microbiology & Techniques in Biology	2	0	2	2
	III	29	Allied - II		4	4	0	3
	III	30	Allied Practical II		2	0	2	2
	IV	31	Skilled Based II	Personality Development and Yoga	4	4	0	4
	IV	32	Non-Major Elective	Food and Nutrition/Botany for Competitive Examination	2	2	0	2
	V	33	Extension Activity	NCC/NSS/YRC/YWF	-	-	-	1
				Subtotal	30	26	4	26
V	III	34	Core – Paper VII	Morphology and Taxonomy of Angiosperms & Economic Botany	6	6	0	4
	III	35	Core – Paper VIII	Biochemistry & Bioinformatics	6	6	0	4
	III	36	Major Elective-1	Plant Biotechnology & Genetic Engineering/Environmental Biotechnology	5	5	0	4
	III	37	Major Elective - 2	Horticulture and Plant Breeding/Forestry	5	5	0	4
	III	38	Major Practical V, VI	Morphology and Taxonomy of Angiosperms, Economic Botany Biochemistry, Bioinformatics and Electives I & II	6	0	6	4
	IV	39	Skill Based III Common	Computer	2	2	0	2
					Subtotal	30	22	8
VI	III	40	Core Paper IX	Plant Physiology	6	6	0	4
	III	41	Core Paper X	Genetics, Evolution and Biostatistics	6	6	0	4
	III	42	Core Paper XI	Plant Ecology & Phytogeography	5	5	0	4
	III	43	Major Practical VII, VIII and IX	Plant Physiology, Genetics, Evolution, Biostatistics, Plant Ecology & Phytogeography	8	0	8	6
	III		Group Project		5			4
				Subtotal	30	17	13	22
Grand Total					180	143	37	145

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc.Botany) / Semester – I / Core – I

PLANT ANATOMY AND MICRO TECHNIQUES

(4 hrs/week)

UNIT –I

12Hrs

Meristems – Characteristics of meristematic tissues – Types, functions and Theories of meristems. Structure and functions of simple and permanent tissues – parenchyma, collenchyma, sclerenchyma, xylem and phloem.

UNIT – II

12Hrs

Structure of dicot stem and root, structure of monocot stem and root, structure of dicot and monocot leaves.

UNIT – III

12Hrs

Normal secondary thickening in dicot stem and root, anomalous secondary growth in the stem of *Boerhaavia* and *Dracaena*.

UNIT – IV

12Hrs

Nodal anatomy: Types of nodes – unilocular, trilocular and multilocular; leaf traces and leaf gaps; epidermal tissue system: stomatal types, hair, trichomes and glands.

UNIT – V

12Hrs

Microscopy: Principle and working of simple and compound light microscopes and electron microscope (TEM only). Micro techniques – simple staining, double staining and preparation of permanent slides – Maceration

PRACTICALS:

1. To observe and identify the following slides showing
 - a. Meristems – shoot apex and root apex
 - b. Simple tissues
 - c. Xylem elements
2. Primary structure of stem, root and leaves of dicot and monocot plant.
3. Normal secondary thickening in dicot stem and root.
4. Anomalous secondary growth in *Boerhaavia* and *Dracaena*.
5. Maceration technique (Xylem elements only)
6. Demonstration: Preparation of double stained permanent slides.

ALGAE AND BRYOPHYTES
(4 hrs/week)

UNIT –I **12Hrs**
General characters and classification of Algae based on Fritsch (1945), life cycle patterns of Algae, systematic position, distribution, structure, reproduction and life history of *Volvox* and *Caulerpa* .

UNIT – II **12Hrs**
Systematic position, distribution, structure, reproduction and life history of *Chara*, *Sargassum* and *Gracilaria*.

UNIT – III **12Hrs**
Seaweed cultivation – *Gracilaria*; Methods of extraction and uses of agar-agar and carrageenin; Economic importance of Algae.

UNIT – IV **12Hrs**
Morphology, mass culture and nutritive importance of *Spirulina*; Morphology, mass culture and economic importance of *Nostoc*.

UNIT – V **12Hrs**
General characters and classification of Bryophytes by Rothmaler (1951); systematic position, distribution, structure, reproduction and life history of *Marchantia*.

PRACTICALS

1. Study of morphology of the Algae and Bryophytes prescribed in the syllabus.
2. Make suitable micro preparations of the following:
 - a. *Caulerpa*– Rhizomeb. *Sargassum* - Stipe, leaf
 - c. *Gracilaria*–Thallus with cystocarpd. *Marchantia* – Thallus.
3. Observe and identify the microslides
 - a. *Volvox* - Vegetative colony, colony with daughter colonies and sexorgans.
 - b. *Chara* - Sex organs
 - c. *Sargassum* - Male and female conceptacles
 - d. *Gracilaria* - Thallus with cystocarp.
 - e. *Marchantia* – V.S of Gemma cup, V.S of Antheridiophore, V.S of Archegoniophore, V.S of Sporophyte
 - f. Algal Slides/ Tablet - *Spirulina*, *Nostoc*; BGA – fertilizer (packet);.
4. Field trip of minimum one day.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc.Botany) / Semester – I / Allied – I

Semester I / III
PLANT DIVERSITY AND MEDICINAL BOTANY
4hrs/week

UNIT – I

General characters and economic importance of Algae – Distribution, Structure and Life History of Volvox; General characters and economic importance of Fungi – Distribution, Structure and Life History of Polyporus

UNIT – II

General characters and classification of Lichens; Structure and Reproduction of Usnea. General characters of Bryophytes; Structure, Reproduction and Life History of Funaria.

UNIT – III

General characters of Pteridophytes; Structure, Reproduction and Life History of Lycopodium. General characteristics of Gymnosperms ; Structure, Reproduction and Life History of Pinus.

UNIT – IV

Bentham and Hooker's system of classification; Critical study of the following families: Rutaceae, Asclepiadaceae, Euphorbiaceae and Poaceae.

UNIT – V

Study of the following plants with reference to the morphology of the useful parts and their medicinal importance: *Aloe vera*, *Piper nigrum*, *Phyllanthusamarus*, *Coleus amboinicus* and *Catharanthusroseus*,.

Practical's

1. Assign the given plant to its family, giving reasons.
2. Dissect out and draw the floral parts of the plants belong to the families prescribed in the syllabus.
3. Make suitable micropreparations of Lycopodium stem, Pinus needle.
4. Identify and record the medicinal values and morphology of the useful parts of the plants prescribed in the syllabus.
5. Observe and identify the following specimens: Polyporus, Funaria, Lycopodium and Pinus –male and female cone.
6. Identify the slides showing mature anther, ovule, dicot embryo, Volvox, Nostoc, Yeast, Lycopodium - cone L.S and Funaria -capsule L.S.

FUNGI, PLANT PATHOLOGY AND LICHENOLOGY
(4 hrs/week)

UNIT I

12Hrs

General characters and classification of fungi based on Alexopoulos (1962). occurrence, systematic position, structure, reproduction and life cycle of *Albugo* and *Mucor*.

UNIT II

12Hrs

Occurrence, systematic position, structure, reproduction and life cycle of *Peziza* and *Puccinia*. Economic importance of fungi: Role of fungi in medicine, industry, agriculture, food and food products.

UNIT III

12Hrs

Study of the following plant diseases with special reference to the symptoms, etiology, dissemination and control measures: Tikka disease of groundnut, Red rot of sugarcane; Paddy blast.

UNIT IV

12Hrs

Study of the following plant diseases with special reference to the symptoms, etiology, dissemination and control measures: Citrus canker, Bunchy top disease of Banana and Tobacco Mosaic viral disease.

UNIT V

12Hrs

Lichens: General account, types and economic importance of Lichens. Structure and reproduction with special reference to *Usnea*.

PRACTICALS

1. Micro preparation and identification of *Peziza*, *Puccinia* and Lichen thallus.
2. Spotters:
 - i. Slides - *Albugo*, *Mucor*, *Usnea*- VS of apothecium, *Puccinia* – Uredosorus and Teleutosorus
 - ii. Disease infected leaves showing *Albugo* and *Puccinia*; *Usnea* habit
 - iii. Observe and identify the following Plant diseases.
 - a. Tikka disease of Groundnut
 - b. Red Rot of Sugarcane
 - c. Paddy Blast
 - d. Citrus Canker
 - e. Bunchy Top of Banana
 - f. Tobacco Mosaic Viral disease
5. Maintain a record note book.

**CELL BIOLOGY & EMBRYOLOGY OF ANGIOSPERMS
(4 hrs/week)**

UNIT I

Cell Biology: Structure of a Plant cell – prokaryotic and eukaryotic cell, structure and functions of cell wall, plasma membrane, endoplasmic reticulum and ribosome.

UNIT II

Structure and functions of Mitochondria, Chloroplast, Nucleus, Chromosome.

UNIT III

Non-living inclusions - cystolith, raphides, starch grains.

Cell Division: Mitosis and Meiosis.

UNIT IV

Embryology : Structure of Microsporangium, microsporogenesis, development of male gametophyte. Types and structure of megasporangium, Megasporogenesis, development of female gametophyte, Types of embryo sac: Monosporic – Polygonum type; Bisporic – Allium type; Tetra sporic - Peperomia type

UNIT V

Double fertilization, types of endosperm – nuclear, cellular and helobial; Ruminant endosperm. Structure and Development of dicot embryo (Capsella) and Polyembryony.

PRACTICALS

Cell Biology

1. Mitosis using Onion roots.
2. Electro micrographs of cell organelles – Chloroplast, Mitochondria and Nucleus.
3. Non-living inclusions – Starch grains, Cystolith and Raphides.

Embryology of Angiosperms

1. Dissect out any one stage of embryo.
2. Identification of slides/specimen/photographs showing the C.S of mature anther, Ovules-orthotropous and anatropous; dicot embryo and Polyembryony
3. Specimen – Ruminant endosperm

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc.Botany) / Semester-II / Allied –II

Semester II/IV

EMBRYOLOGY, PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY

4hrs/week

UNIT – I

Structure and development of microsporangium; Structure, types and development of megasporangium; Development of male and female gametophyte; Double fertilization, Endosperm – types, Structure of dicot embryo.

UNIT – II

Meristem - Structure and classification. Simple tissues, complex tissues; Primary structure of **Dicot** and Monocot stem and root; Structure of leaf; Normal secondary thickening in dicot stem.

UNIT – III

Absorption of water – diffusion, osmosis, imbibition, mechanism of absorption of water; Ascent of sap – (cohesion theory only); Transpiration – Types, Mechanism of stomatal transpiration (Starch – sugar hypothesis); Photosynthesis importance of photosynthesis, Mechanism of Photosynthesis – Light and dark reaction (Calvin cycle).

UNIT – IV

Nostoc - Morphology, Use as Biofertilizer and Mass cultivation; Structure, multiplication (budding and fission) and Mass culture of Yeast.

UNIT – V

Tissue Culture – Scope and importance - totipotency, Nutrient media(M.S medium) Callus and Meristem Culture; Applications of plant tissue culture.

**MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc.Botany) / Semester – II /
Allied Practical –II**

PRACTICAL – 2

EMBRYOLOGY, PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY

- 1) Dissect out young embryo from *Tridax* flower bud.
 - 2) Make suitable micro-preparations of dicot and monocot stem, root and leaf.
 - 3) Demonstrate the physiology experimental set up –Potato osmoscope, Ganong's light screen, Bell jar experiment
 - 4) Identify the Photograph/ Slide/ Specimen/setup - (i) *Nostoc* (ii) Yeast (iii) Callus culture, (iv) Meristem culture.
 - 6) Maintain a record note book for external and internal evaluation.
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TIRUNELVELI**

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B.Sc. Botany**

(Choice Based Credit System)

(With effect from the academic year 2017 -2018)

III	I	17	Language	Tamil/Other Languages	6	6	0	4
	II	18	Language	English	6	6	0	4
	III	19	Core Paper V	Pteridophytes, Gymnosperms & Paleobotany	4	4	0	4
	III	20	Major Practical 3	Pteridophytes, Gymnosperms & Paleobotany	2	0	2	1
III	21	Allied – II Paper I		4	4	0	3	
	22	Allied Practical II		2	0	2	1	
	23	Skill Based Core I	Mushroom Cultivation/ Organic Farming	4	4	0	4	
IV		Common	Yoga	2	2	0	2	
IV	24	Non-Major Elective I		2	2	0	2	
			Subtotal	32*	28	4	25	
IV	I	25	Language	Tamil/Other Languages	6	6	0	4
	II	26	Language	English	6	6	0	4
	III	27	Core Paper VI	Microbiology & Techniques in Biology	4	4	0	4
	III	28	Major Practical 4	Microbiology & Techniques in Biology	2	0	2	1
	III	29	Allied – II Paper II		4	4	0	3
	III	30	Allied Practical II		2	0	2	1
	IV	31	Skill Based Core II	Floriculture/ Preservation of Fruits and Vegetables	4	4	0	4
	IV	32	Non-Major Elective II		2	2	0	2
	IV		Part IV	Common-Computers for Digital Era	2	2	0	2
	V	33	Extension Activity	NCC/NSS/YRC/YWF	-	-	-	1
			Subtotal	32*	28	4	26	

V	III	34	Core Paper VII	Morphology & Taxonomy of Angiosperms	5	5	0	4
	III	35	Core Paper VIII	Biochemistry & Biophysics	5	5	0	4
	III	36	Major Elective-1	Plant Biotechnology & Genetic Engineering/Environmental Biotechnology	5	5	0	4
	III	37	Major Elective - 2	Horticulture and Plant Breeding/Forestry	5	5	0	4
	III	38	Major Practical V	Morphology and Taxonomy of Angiosperms & Elective II	3+1	0	3+1	2
			Major Practical VI	Biochemistry, Biophysics and Elective I	3+1	0	3+1	2
	IV	39	Skill Based Common	Personality Development/Effective Communication/Youth Leadership	2	2	0	2
				Subtotal	30	22	8	22
VI	III	40	Core Paper IX	Plant Physiology	5	5	0	4
	III	41	Core Paper X	Genetics, Evolution and Biostatistics	5	5	0	4
	III	42	Major Elective 3	Plant Ecology & Phytogeography / Marine Biotechnology	5	5	0	4
	III	43	Major Practical VII	Plant Physiology& Elective III	3+1	0	3+1	2
			Major Practical VIII	Genetics, Evolution, Biostatistics	2	0	2	1
	III		Group Project		9		9	6
Subtotal					30	15	15	21
Grand Total					184*	145	39	140

* Extra hour classes can be arranged for Common Yoga / Computers for Digital Era

MSU/2017-2018/B.Sc. Botany/Semester-III/Core Paper – 5
PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY
(4hrs/week)

Preamble:

LTPC

4 0 0 4

Knowledge on cryptogams and phanerogams and primary information about fossil record is a prerequisite. It provides a thorough knowledge about the diversity, structural organization and reproduction of Pteridophytes and Gymnosperms. It also makes the students aware of the preserved vestiges of plant life of the geological past.

UNIT I

(12L)

Pteridophytes:

General Characteristics and Classification of Pteridophytes (Sporne 1966), *Psilotum* and *Lycopodium*: Distribution, Systematic Position, Structure, Reproduction and Life History (need not study the development of gametophyte, sex organs and sporophyte).

UNIT II

(11L)

Adiantum, *Marsilea*: Occurrence, Systematic Position, Structure, Reproduction and Life Cycle (need not study the development of gametophytes, sex organ and sporophyte), Stellar Evolution in Pteridophytes.

UNIT III

(13L)

Gymnosperms:

General Characteristics and Classification of Gymnosperms (David Bierhorst, 1971), *Pinus*: Distribution, Systematic Position, Structure, Reproduction and Life History

UNIT IV

(14L)

Gnetum: Occurrence, Systematic Position, Structure, Reproduction and Life Cycle of (need not study the Development of Sex Organs and Sporophyte). Economic Importance of Gymnosperms.

UNIT V

(10L)

Paleobotany:

Geological Time Scale, Methods of Fossilization; Brief Study of *Rhynia*, *Lepidodendron* and *Lyginopteris*.

REFERENCES

- Arnold, C.A. 1947. An introduction to Palaeobotany. McGraw Hill Co. Ltd., New Delhi.
- Chamberlain, C.A. 1986. Gymnosperms-Structure and Evolution, Publishers & Distributors.
- Pandey, S.N. 1995. A Textbook of Pteridophyta. Vikas Publishing House, Ghaziabad.
- Smith, G.M. 1955. Cryptogamic Botany. Vol. III. McGraw Hill Co.
- Sporne, K.R. 1976. Morphology of Pteridophytes. B.I. Publishers, New Delhi.
- Vashista, P.C. 1971. Botany for Degree students: Pteridophyta. S. Chand & Co., New Delhi.
- Vashista, P.C. 1978. Botany for degree students: Gymnosperms. S. Chand & Co., New Delhi

PRACTICALS

1. To make suitable micro preparations of the following:
Lycopodium Stem, *Adiantum* Stipe, *Marsilea* Petiole, Rhizome and Sporocarp.
Pinus Stem and Needle, *Gnetum* Stem and Leaf.
2. To observe and identify Specimens and Microslides.
Psilotum Habit, Stem T.S, Synangium L.S; *Lycopodium* cone L.S, *Adiantum* habit,
Pinus -Male and Female Cone (Specimen), L.S of Male and Female Cone (Slide)
Gnetum – Male and Female Cone (Specimen); L.S. of Male cone, Female Cone & Ovule.

Paleobotany (Slide):

Rhynia stem

Lepidodendron stem

Lyginopteris stem.

3. To maintain a Record Notebook.

MSU/2017-18/ B. Sc Botany / Semester –III

Skill Based Subject - I (A)

MUSHROOM CULTIVATION

(4hrs/week)

Preamble:

LTPC

4 0 0 4

Keeping the employment entrepreneurship in mind, this paper has been included. The subject enables the students to identify the edible mushrooms, to know the cultivation of Paddy Straw Mushroom and preparation of recipes. The course content also has the new practical exercises so that the students get a hands-on experience of the latest techniques that are currently in use.

UNIT I

(11hr)

Mushrooms:

Introduction, Identification of Edible and Poisonous Mushrooms, Medicinal Mushrooms, Structure and Life cycle of Edible Mushroom-Oyster (*Pleurotus* species), Prospects of Mushroom Cultivation in Small Scale Industry.

Unit II

(13hr)

Mushrooms Culture:

Pure culture - Preparation of Medium (PDA and Oat meal Agar Medium,) Sterilization methods, Preparation of Test Tube Slants to Store Mother Culture, Culturing of *Pleurotus* mycelium on Petri Plates, Preparation of Mother Spawn in Saline Bottle and Polypropylene Bag and their Multiplication.

Unit III

(12hr)

Mushroom Culture Technique:

Cultivation of Mushrooms-Infrastructure, substrates (locally available), Polythene bag, Mushroom bed preparation - Factors affecting the Mushroom Bed Preparation, Spawn Running and Harvesting of Mushrooms - Button mushroom (*Agaricus bisporus*), Oyster Mushroom (*Pleurotus sp.*) and Paddy Straw Mushroom (*Volvariella sp.*)

Unit IV-

(13hr)

Post Harvesting Technology of Mushrooms:

Farm Design and Protection of Mushrooms from Pests and Diseases. Nutritional Value – Proteins, Amino Acids, Mineral Elements, Carbohydrates, Fibre content and Vitamins, Significance of Mushrooms.

Unit V

(11hr)

Storage&Value Added Food Preparation

Short-Term Storage (Refrigeration – upto 24 hours) Long Term Storage (Canning, Pickles, Papads), Drying, Storage in Salt Solutions, Value Added Food Preparation : Types of Food Prepared from Mushroom; Soup, Cutlet, Omelette, Samosa, Pickles, Curry.

REFERENCES

- Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
- Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
- Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II

PRACTICALS

Demonstration:

1. Identification of edible mushrooms.
2. Cultivation of Paddy Straw Mushroom.
3. Preparation of recipes.

MSU/2017-18/ B. Sc Botany / Semester –III
Skill Based Subject - I (B)
ORGANIC FARMING
(4hrs/week)

Preamble:

LTPC

4 0 0 4

The contents have been drawn-up to accommodate the role of manures in the improvement soil fertility, soil profile, different kinds of soil, biofertilizer production technology, vermicomposting etc. in organic farming. It makes the students aware about sustainable use of biofertilizers

Unit -I

(11hr)

Soil Science:

Brief Account of Soil Profile, Fertility of Soil – Importance of Organic Matter – Water Retentivity and Aeration of Soil.

Unit – II:

(12hr)

Manure and Manuring:

Organic Manure, Types, Animal Wastes – Cattle Dung, Urine, Poultry Wastes, Slaughter Wastes, Piggery and Fishery Wastes.

Unit – III

(10 hr)

Green Manure:

Plant wastes – Fallen leaves and Twigs, Humus Formation, Green Manuring, Mulching - Leaves of Trees like *Pongamia*, *Gliricidia*, *Azadirachta*, and *Calotropis*, Compost making.

Unit-IV

(13hr)

Biofertilizers:

Rhizobium-Importance, Mass Production and Application, VAM Fungi – Importance, Mass production and Applications.

Unit-V

(14hr)

Vermicomposting:

Importance, Application and Production of Vermicompost, Preparation and importance of Panchagavyaas foliar spray.

PRACTICALS:

1. Soil Profile
2. Capillarity of Different kinds of Soil.
3. Vermicomposting
4. Preparation of Organic Manure
5. Identification of the following plants:
 - a. *Pongamia*,
 - b. *Gliricidia*
 - c. *Azadirachta* and
 - d. *Calotropis*.
2. Maintain an Observation Notebook.

REFERENCES:

- Dubey, R.C. 2006, A Text Book of Biotechnology, S. Chand and Company Ltd. New Delhi.
- ICAR, 1980. Hand Book of Agriculture, Indian Council of Agricultural Research, New Delhi.
- John JothiPrakash, E. 2006. Outlines of Biotechnology. Emkay Publications, New Delhi.
- Mark Coyne, 2004. Soil Microbiology- An Exploratory Approach. Delmar Publishers, Singapore.
- Miller, C.E. and Turk, L.M. 2002. Fundamentals of Soil Science. Biotech Books, New

MSU/2017-18/ B. Sc Botany/ Semester –IV /Core paper-6
MICROBIOLOGY AND TECHNIQUES IN BIOLOGY
(4hrs/week)

Preamble:

LTPC

4 0 04

The scientific discipline of Microbiology is one of the most critical components of modern science. The main focus of this paper is to give an idea of the world of microbes and to evaluate their role in the environmental segments to the learners. The contents have been drawn to accommodate the techniques in biology and to highlight their role in the human welfare.

UNIT I

(13L)

Microbiology:

Brief History and Development, Classification of Microorganisms (Whittaker's Five Kingdom Concept), **Bacteria** - Outline of Classification (Bergey's manual), Ultra Structure, Nutritional Types and Reproduction of Bacteria, Media Preparation and Pure Culture techniques of Bacteria, Staining Technique - Gram Staining.

UNIT II

(12L)

Viruses:

General Characteristics, Structure and Reproduction of HIV, T₄ Bacteriophages, Viroids, Virions and Mycoplasma, Transmission of Viruses and Purification of Viruses.

UNIT III

(12L)

Microbes:

Microbes in Food Production, Spoilage, Poisoning and Preservation. Bacteria Flora in Milk, Pasteurization of Milk and Milk Products, Bacterial Pathogens and Water Pollution, Drinking Water as a Vehicle of Diseases, Purification of water.

UNIT IV

(11L)

Instruments:

Principles, Working Mechanism and Applications of UV Spectrometer, Centrifuge, ECG, MRI and Positron emission tomography

UNIT V

(12L)

Electrophoresis:

Basic principles, electrophoretic mobility, factors, isoelectric focusing. Types- vertical and horizontal agarose and poly acrylamide gel electrophoresis, detection and recovery of electrophorogram. Gel documentation system. X-ray crystallography.

PRACTICALS

1. Preparation of Culture Media for Bacteria.
2. Preparation of Serial Dilution.
3. Isolation of Bacteria – Streak Plate Method
4. Identify the type of Bacteria using Gram Staining.
5. Analysis of Milk – Methylene Blue Dye Reduction Test.

6. **Spotters:**

Ultra Structure of Bacterial Cell, T₄ Phage, HIV Virus, Autoclave, Laminar Air Flow Chamber, Hot Air Oven, Inoculation Needle, Agar slant, Spoiled Food, UV Spectrophotometer, Clinical Centrifuge, ECG, MRI, Positron emission tomography, Electrophoresis.

7. To maintain a Record Notebook.

MSU/2017-18/ B. Sc Botany / Semester –III

Skill Based Subject - I (A)

PRESERVATION OF FRUITS AND VEGETABLES

(4hrs/week)

Preamble:

LTPC

4 0 04

The well-organized curricula shall inspire the students regarding the principles of preservation of fruits and vegetables. The learners are expected to know the nutritive values, importance, factors affecting storage and methods of preservation of fruits and vegetables and preservation recipes.

Unit-I

(11L)

Fruits and Vegetables:

Nutritive values, factors affecting storage, spoilage - microbial, enzymatic and insects.

Unit-II

(13L)

Principles of Preservation:

Importance and Methods of Preservation - Refrigeration, Freezing, Canning, Drying and Dehydration, Chemical preservatives.

Unit-III

(13L)

Preparation of Products:

Methods of preparation of Fruit Juice- Orange, Squashes- grape and Pine apple; Jam - Tomato and Mixed Fruit , Jellies- Guava.

Unit- IV

(11 L)

Preparation of Chutney, Sauce, Pickles & Ketchup:

Preparation of Chutney- Mango, Sauce –Tomato, Pickles- Lime, Mango and Garlic, Ketchup- Tomato. **Drying of fruits:** Banana, Mango, Grapes and Fig.

Unit- V

(12 L)

Canning of Fruits & Vegetables:

Mango and Banana; Tomato, Carrot, Bean and Mushrooms.

REFERENCES:

- Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil.
- C.K. Usha Rani and R. Mary Christi. 2010. Preservation of Fruits and Vegetables,SheenGrafix, Nagercoil.
- GirdhariLal, G.S. Siddappa and G.L.Tandon, 1986, Preservation of Fruits and Vegetables,Indian Council of Aricultural Research, New Delhi.
- Cruess W.V.1948. Commercial Fruits and Vegetables Products, McGraw Hill Book Company Inc, New York.
- Alex.V and Ramani.2009. Food Chemistry, MPJ Publishers, Chennai.
- V.Kumaresan. 2009.Horticulture, Saras Publication, Nagercoil.

MSU/2017-18/ B. Sc Botany / Semester –III
Skill Based Subject - I (B)
FLORICULTURE

(4hrs/week)

Preamble:

LTPC

4 0 04

The course provides thorough knowledge about the commercial cultivation of flowers and different value added products prepared from it. It highlight the potential of these studies to become an entrepreneur.

UNIT- I : (11L)

Floriculture:

Importance, Cut flower production – Chrysanthemum, Tulips, Lavendula, Gerbera, Gladiolus and Helichrysum.

UNIT-II : (13 L)

Commercial Floriculture:

Definition, Cultivation of Calendula, Polyanthus and Marigold.

UNIT- III: (14 L)

Cultivation Techniques:

Cultivation of Anthurium, Orchids, Cut flower production, Package and export

UNIT-IV: (12 L)

Value Added Products of flowers:

Importance of flowers in Perfumery - Extraction of Rose and Jasmine oil and their products.

UNIT – V (10 L)

Flower arrangement:

Introduction, General Principles of Flower Arrangement, Western and Japanese, Dry flower Decorations.

REFERENCES

- Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil.
- Kumaresan,V. 2009. Horticulture, Saras Publication, Nagercoil.
- Randhawa., G.S. 1973. Ornamental Horticulture in India. Today and Tomorrow Printers and Publishers, New Delhi.
- Vishnu Swarap. 1997. Garden flowers. National Book Trust, India.

MSU/2017-2018/B.Sc. Botany/Semester-V/Core Paper – 7
MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS
(5hrs/week)

Preamble:

LTPC
5 0 0 4

This enriches the students to have a broad knowledge about various families, local flora and classification of plants based on natural system. It will equip the learners with skills to identify angiosperms and economical use of local plants.

UNIT I

(13L)

Modifications Phyllotaxy & Inflorescence:

Modifications: Root, stem and leaf; Phyllotaxy: Types; Inflorescence: Types; Description of floral parts; Herbarium preparation and its importance.

UNIT II

(14L)

Principles of taxonomic hierarchy, classification & Key:

Species, Genus and Family concept; Systems of classification- (with merits and demerits) Natural- Bentham and Hooker system, Phylogenetic- Engler and Prantl System. Binomial nomenclature, Dichotomous key preparation.

UNIT III

(15L)

Detailed study of the following families and their economic importance:

Annonaceae, Sterculiaceae, Rutaceae, Caesalpiniaceae, Cucurbitaceae, Apiaceae.

UNIT IV

(17L)

Rubiaceae, Sapotaceae, Convolvulaceae, Asclepiadaceae, Oleaceae, Lamiaceae.

UNIT V

(16L)

Euphorbiaceae, Amaranthaceae, Liliaceae, Cannaceae, Arecaceae and Poaceae.

REFERENCES:

- Lawrence, G. H. M (1953) – Taxonomy of Vascular Plants, Oxford & IBH Publishes, New Delhi.
- Narayanaswamy, R.V &Rao, K. N (1976) – Outlines of Botany, S. Viswanathan Printers & Publishers, Madras.
- Ashok Bendre and Ashok Kumar (1984) – A Text Book of Practical Botany – Vol. II, Rastogi Publications, Shivaji Road, Meerut.
- Mathews, K.M, (1987 – 90) – Flora of Tamil Nadu and Carnatic (1 – 4 Vols.)Rapinat Herbarium, Trichy – 1.
- Davis P. H. and Heywood V.H. (1993) – Principles of Angiosperms Taxonomy
- Vashista, P.C (1997) – Taxonomy of Angiosperms, S. Chand & Co., (P) Ltd., New Delhi.
- Singh, V & Singh, D.K (1983) – Taxonomy of Angiosperms, Rastogi Publications, Meerut.
- Naik, V. N. 2000. Taxonomy of Angiosperms. Tata McGraw – Hill Publishing Company Limited. New Delhi.
- Singh, G. 2005. Plant Systematics – Theory and Practice.Oxford & IBH, New Delhi.
- Verma, V (1974) – A Text Book of Economic Botany, Emkay Publications, New Delhi. 28

PRACTICALS:

1. Morphological identification of plant parts and their modifications.
2. Technical description of plant parts and dissection of floral parts of plants with reference to the families prescribed in the syllabus.
3. Field trips (minimum 2 days) to places under the guidance of teachers to study plants in their natural habitat and submit a report.
4. Preparation of dichotomous key.
5. Identify and comment on the useful plant parts or plants prescribed in the syllabus.
6. Preparation and submission of 10 herbarium sheets.
To maintain a record book.

MSU/2017-2018/B.Sc. Botany/Semester-V/Core Paper – 8
BIOCHEMISTRY AND BIOPHYSICS
(5hrs/week)

Preamble:

LTPC

5 0 0 4

This enable the students regarding the basic knowledge on atom, bonds, bio-molecules, enzymes and proteins; to understand the fundamentals of biochemistry and biophysics, and the structure of various bio-molecules. Know the working principle of instruments like pH meter, colorimeter and centrifuge.

UNIT 1

(15L)

Basic concepts of Biochemistry:

Brief account of atom, bonds – ionic, covalent and hydrogen bonds; pH meter, Colorimeter, Centrifuge, Chromatography – Principles, techniques and their application in Biological studies.

UNIT 11

(16L)

Biomolecules:

Carbohydrates- structure and Properties of monosaccharides – Glucose and fructose; disaccharides – Sucrose, Maltose and Lactose; polysaccharides – Starch, Cellulose, Lignin and Chitin.

UNIT 111

(14L)

Aminoacids:

Basic Structure, Classification, Essential and Non-essential amino acids; Proteins- Primary, Secondary, Tertiary and Quaternary structure and properties; Monomeric and oligomeric proteins (Myoglobin and Hemoglobin)

UNIT IV

(16L)

Lipids&Enzymes:

Lipids:General characters, Types, Basic structure and properties;Enzymes: General classification, Nomenclature, Mechanism of enzyme action, Enzyme kinetics, Enzyme inhibition, Enzyme immobilization, Application of enzymes in industry and medicine.

UNIT V

(14L)

Bioenergetics:

Bioenergetics of Chloroplast and Mitochondria, Structure and role of ATP in biological systems, ATP as energy rich compound. Biological energy conversion, Electromagnetic spectrum, Absorption spectrum - chlorophylls, Emission spectrum - Phosphorescence, Fluorescence.

REFERENCES:

Jain, J.L. (1998). Fundamentals of Biochemistry. S. Chand & Co., New Delhi.

Jayaraman, J. (1981). Laboratory Manual of Biochemistry. Wiley Eastern Ltd., New Delhi.

John Webster, (2004). Bioinstrumentation. John Wiley & sons.

Lehninger, A.L. (1984). Biochemistry (2nd Edition). Kalyani Publishers, Ludhiana, New Delhi.

Plummer, D.T. (1988). An Introduction to Practical Biochemistry (3rd Edn.). Tata McGraw Hill Publishing Co., Ltd., New Delhi.

Srivastava, H.S. (1990). Elements of Biochemistry. Rastogi Publications, Meerut, India.

Arora. (2004) Biophysics. First edn. Himalaya Publishers, New Delhi.

Salil Bose, S. (1982). Elementary Biophysics. Vijaya Printers, Madurai

PRACTICALS

1. Colorimetric estimation of starch in plant tissues
2. Colorimetric estimation of sugar in plant tissues
3. Colorimetric estimation of proteins
4. Verification of Beer's Law
5. Preparation of acetate buffer
6. Separation of dyes by paper chromatography
7. Determination of complimentary color

Spotters:

- a. Instruments: Electrodes of pH meter, pH meter, Colorimeter, Centrifuge and Chromatogram
- b. Structure of monosaccharides, disaccharides and polysaccharides prescribed in the syllabus
- c. Models and charts: Absorption spectrum of chlorophyll a and chlorophyll b, Fluorescence, Phosphorescence, Lock and key model & induced fit model of enzyme action To maintain a record book.

MSU/2017-2018/B.Sc. Botany/Semester-V/Elective Paper – 1A

BIOTECHNOLOGY AND GENETIC ENGINEERING

(5hrs/week)

Preamble:

LTPC

5 0 0 4

The syllabus helps to understand the totipotency of the cells and the tissue culture techniques, to learn the fundamental principles in gene cloning, various methods of gene transfer, screening and the use of vectors in gene transfer technology for the desired characteristics.

UNIT I (15L)

Tissue Culture:

Introduction, definition, history, scope and importance of plant tissue culture, Totipotency of cells, Tissue culture laboratory- organization and requirements, Sterilization techniques, Nutrient media- composition and preparation.

UNIT II (14L)

Types of tissue culture:

Callus culture and apical meristem culture. **Protoplast culture:** Protoplast isolation, fusion, selection of hybrids and regeneration. **Cybrids**– production and applications, **Artificial seed:** production, advantages and disadvantages.

UNIT III (16L)

Techniques of genetic engineering:

Isolation of specific genes, enzymes used in gene cloning, **Cloning Vectors** - Plasmids, Cosmids and Phagemids, cDNA Libraries, *Agrobacterium* mediated gene transfer in plants, **GM plants** – *Bt* Brinjal, *Bt* Cotton, Golden rice. Bioethical issues.

UNIT IV (16L)

Identification of Recombinants:

Insertional inactivation, Immunochemical Method and Colony Hybridization Technique. Selection of Recombinant using Selective Medium and reporter genes, **Blotting Techniques** – Southern, Northern and Western Blotting.

UNIT V (14L)

Mutagenesis & DNA transfer techniques:

Site directed mutagenesis and random mutagenesis; DNA transfer techniques: Physical method- Microinjection, Chemical method- Calcium phosphate method, Electrical method- Electroporation, Natural-Conjugation and bacterial transformation.

REFERENCES:

- Bhojwani, S.S and M.K.razdan. 2004. Tissue Culture Theory and Practice.
- Davis J.A. and W.S.Roznikolf (1992) Milestones in Biotechnology.Classic papers on genetic Engineering, Butterworth-Helnemann, Boston.
- Glick, B Pasternak, J.J.(2007) Molecular Biotechnology ASM Press, Washington Benjamin
- Lewin. Genes-VIII.Oxford university press.
- Glover, D.M and B.D Hames.DNA Cloning 1-4.(2006). Oxford University Press.
- Guptha, P.K. 1996. Elements of Biotechnology.Rastogi and Co. Meerut,.
- Hammond, J., P.McGarvey and V.Yusibov(Eds.) 2000.Plant Biotechnology. Springer verlag, 2000.
- James D. Watson. Recombinant DNA (2001).Scientific American Books. USA
- Kingsman S.M. and A.J.Kingsman, (1998) Genetic Engineering.An Introduction to gene analysis and exploitation in eukaryotes.Blackwell Scientific Publications, Oxford.
- Satyanarayanan, U. 2005. Biotechnology, Books and allied (p) Ltd.,

PRACTICALS:

Spotters/Photographs

- i. Callus culture from Carrot Explant.
- ii. Protoplast Isolation.
- iii. Plasmids – Ti plasmids
- iv. Gene cloning in E. Coli.
- v. Agrobacterium mediated gene transfer.
- vi. Blotting Techniques.
- vii. Colony Hybridization technique.
- viii. Transgenic Plants prescribed in the syllabus.To maintain a record note book.

MSU/2017-2018/B.Sc. Botany/Semester-V/Elective Paper – 1B

**ENVIRONMENTAL BIOTECHNOLOGY
(5hrs/week)**

Preamble:

LTPC

5 0 0 4

The paper presents an objective view of the application of biotechnological know-hows in tackling environmental problems. It starts with basic knowledge about molecular biology and later links to application based processes and techniques which also address the socio-economical challenges.

UNIT I (15L)

Environmental Spheres :

Hydrosphere, Geosphere, Biosphere and Anthrosphere. Aims and Scope of Environmental Biotechnology, **Pollution Measurement** : Biotechnological Methods, Criteria for Biomonitoring of Pollution, Molecular biology in Environmental Monitoring and Role of Biosensors in Pollution monitoring, Biotechnological methods for management of Metal Pollution.

UNIT II (15L)

Biofuels:

Biogas – Production of Biogas, stages of Methanogenesis, Methane production from Hydrocarbons, Uses of Biogas, Hydrogen production – Importance of Biological Production of Hydrogen, Microbial production of Hydrogen, Uses of Hydrogen Production Technology. **Petroleum Plants** – *Calotropis, Euphorbia tirucalli, Jatropha curcas*

UNIT III (15L)

Sewage Treatment:

Biotechnological Methods for Sewage and Waste Water Treatment -Primary, Secondary (Aerobic – Trickling filter and Activated Sludge Process, Anaerobic – Anaerobic digestion and Anaerobic Filter) and Tertiary Treatment (Ion Exchange Method), Water Recycling, Soil Conservation and Restoration, Sustainable Agricultural Management.

UNIT IV (15L)

Biodegradation:

Solid Waste Treatment and Disposal, Biodegradation of Hydrocarbons, Pesticides and Herbicides. **Bioremediation:** Types of Bioremediation: *in situ* and *ex situ*, Phytoremediation, Biosensors and Bioindicators, Bioleaching, Types of Reactions in Bioremediation, Genetically Engineered Microorganisms in Bioremediation.

UNIT V

(15L)

Global Environmental Problems:

Green House Effect and Global Warming; measures to Control Green House Effect; Ozone Depletion -Effects and Control Measures; Acid rains — Causes, Effects and Control Measures; Remote Sensing and its applications in ecology.

References:

- Chatterji, A.K. (2011). *Introduction to Environmental Biotechnology*. Prentice Hall India Pvt., Ltd., New Delhi.
- Dubey, R.C. (2013). *A Textbook of Biotechnology*. S. Chand & Company Ltd., New Delhi.
- Gupta, P.K. (1994). *Elements of Biotechnology*. Restogi Publications, Meerut.
- Ignacimuthu, S. (1997). *Plant Biotechnology*. Oxford & IBM Publishing Co., New Delhi.
- Kumar, H.D. (1991). *A Textbook on Biotechnology*. East west press, New Delhi.
- Parihar, P. (2014). *A Textbook of Biotechnology*. Argobios Publications, Jodhpur
- Purohit, S.S. (2003). *Agricultural Biotechnology*. Agrobios Publications, Joshpur.
- Sharma, P.D. (1994). *Environmental Biology*. Rastogi Publications.

PRACTICALS:

Photographs/Model

1. Biosensor
2. Biogas Plant
3. Sewage Treatment
4. Acid Rain
5. Green House Effect

Spotters

Petro Plants

- i. *Calotropis*
- ii. *Euphorbia tirucalli*
- iii. *Jatropha curcas*

To maintain a record note book.

MSU/2017-2018/B.Sc. Botany/Semester-V/Elective Paper – 2A
HORTICULTURE & PLANT BREEDING
(5hrs/week)

Preamble: LTPC

5 0 0 4

The students will learn the methods of crop improvement and the importance of horticulture in human welfare. It enables the students to acquire knowledge on the application of induced mutations, induced polyploidy and wide hybridization for crop improvement. This fundamental course will help the students to undertake the breeding of horticultural crops.

UNIT - I **(14L)**

Horticulture:

Scope, importance and divisions, Vegetative propagation methods- cutting, layering, budding, grafting and vegetative propagules (bulb, sucker, corm). Advantages and disadvantages of vegetative propagation.

UNIT - II **(16L)**

Gardening:

Types of gardens – Formal, informal, Design and Establishment of Garden, Garden components, garden implements, lawn making, glass house, rockery, hanging baskets, water garden, terrarium, topiary and Bonsai.

UNIT - III **(15L)**

Kitchen garden:

Establishment, Organic manures and growth regulators in horticulture, Plant protection measures for horticulture, Seed Propagation methods, Preparation of Nursery beds, Transplantation – steps and Methods.

UNIT - IV **(16L)**

Plant Breeding-

Nature, Scope and Objectives, Plant introduction, selection methods (pure line and mass), Hybridization techniques, Heterosis breeding, Interspecific and intergeneric hybridization.

UNIT – V **(14L)**

Mutation breeding:

Procedure and practices, Mutagens, Polyploidy breeding and its applications. Breeding for disease resistance.

REFERENCES:

- Allard, R.W. (1960). *Principles of Plant Breeding*. John Wiley & Sons, New York.
- Bose, T.K., Maiti, R.G., Dhua, R.S. and Das, P. (1999). *Floriculture and Landscaping*. NayaPrakash, Calcutta.
- Chopra, V.L. (1989). *Plant Breeding*. Oxford IBH, New Delhi.
- Kumar, N. (1997). *Introduction to Horticulture*. Rajalakshmi Publication, India.
- ManibhushanRao, K. (1991). *Text Book of Horticulture*. Macmillan Publications, New Delhi.
- Mukherjee, D. (1972). *Gardening in India*. Oxford & IBH Publishing Co., Kolkatta, Mumbai, New Delhi.
- Roy Choudhry, N. and Mishra, H.P. (2001). *Text book on Floriculture and Landscaping*. Raja Infotech Enterprise, India.
- Sharma, J.R. (1994). *Principles and Practice of Plant Breeding*. Tata McGraw Hill, New Delhi.

PRACTICALS :

Demonstration

- i. Vegetative methods of propagation.
 - a. Cutting-Stem and Leaf cutting
 - b. Layering-Simple and air layering.
 - c. Grafting – Tongue grafting.
 - d. Budding – T-budding.
- ii. Garden components -Rockery, hanging baskets, terrarium and topiary.
- iii. Garden implements-spade, water can, pruning scissors, digging fork
- iv. Designing Kitchen Garden.
- v. Plant Breeding: Emasculation and Bagging methods.

To maintain a record note book.

MSU/2017-2018/B.Sc. Botany/Semester-V/Elective Paper – 2B
FORESTRY
(5hrs/week)

Preamble:

LTPC

5 0 0 4

To know about the types of forest, its degradation, agroforestry and its economic utilization. It make the students aware about conservation and sustainable use of plants for future generation.

UNIT-1

(13L)

Forest:

Definition, Scope and Classification ,Importance/Functions of forest, Forest as a Balanced Eco system, Types and Distribution of Forest with reference to India (Champion and Seth - Classification)

UNIT II

(17L)

Forest Degradation:

Damage caused by Fire, Climatic Factors and Injuries by Insects, Plants, Animals and Diseases, activities of Man including Encroachment and Shifting Cultivation, Measures to Protect the Forest Damage caused by various Factors.

UNIT III

(16L)

Forest Management and Conservation:

Regeneration, Tending Operations, Sustainable Utilization of Forest Resources, Forest Organization, Role of Remote Sensing in Forest Management.

UNIT IV

(15L)

Agroforestry:

Objectives, Advantages and Disadvantages. Energy Plantation, Recreational Forestry, Role of Biosphere reserves, National Parks, Sanctuaries and Botanical Gardens in Conservation of Wild life.

UNIT V

(14L)

Forest Utilization:

Conservation, Storage and Disposal of Wood in Forest, Major and Minor Forest Products, Forest based Industries- Paper and Pulp Industry, Resin tapping and Turpentine manufacture.

REFERENCES:

- Agrawal, K.C. (1987). *Environmental Biology*. Agro Botanical Publisher, India.
- Arumugam, N. (1994). *Concepts of Ecology* (Environmental Biology). Saras Publications, Nagercoil, Tamilnadu.
- Kumar, H.D. (1992). *Modern Concepts of Ecology* (7th Edn.). Vikas Publishing Co., New Delhi.
- Odum, E.P. (1971). *Fundamentals of Ecology* (2nd Edn.). Saunders & Co., Philadelphia & Natraj Publishers, Dehradun.
- Sharma, P.D. (2000). *Ecology & Environment*. Rastogi Publications, Meerut, India.
- Vashishta, P.C. (1990). *Plant Ecology*. Vishal Publications, Delhi, Jalandhar.
- Verma, P.S. and Agarwal, V.K. (1999). *Concept of Ecology* (Environmental Biology). S. Chand & Co., New Delhi.

DEMONSTRATION

1. Identify and find out the uses of wood samples of common timbers.
2. Prepare maps showing forest types in India and Tamil Nadu.
3. Prepare photographs of different forest types and nature of forest degradation.
4. Study of commonly used forest products.

To maintain a record note book.

MSU/2017-2018/B.Sc. Botany/Semester-VI/Core Paper – 9

PLANT PHYSIOLOGY

(5hrs/week)

Preamble:

LTPC

5 0 0 4

To acquaint the students to understand the various functions of the plants, mechanisms of the various activities; anabolic and catabolic The course will enable the learners to gain more information in recent findings in the field of physiology.

UNIT I

(17L)

Water Relations of Plants & Transpiration:

Water Relations: Imbibition, Diffusion and Osmosis; Water Potential- Definition, Components, Absorption of Water – Mechanism and Factors affecting Water Absorption; Transpiration- Definition, Types, Significance and Mechanism of Stomatal Transpiration- steps and theories, Guttation

UNIT II

(15L)

Ascent of Sap & Mineral nutrition:

Ascent of Sap – Definition, Path of Ascent of Sap, Mechanism- Transpiration Pull and Cohesion Theory. Mineral nutrition - Macro and Micro Nutrients- Absorption of Mineral Salts – Mechanism, Translocation of Organic Solutes - Mechanism of Phloem Transport (Munch's Mass flow hypothesis).

UNIT III

(16L)

Photosynthesis & Respiration:

Photosynthesis: Light and Dark Reactions - Photosynthetic Electron Transport Chain and Photophosphorylation (Cyclic and Non cyclic); Carbon Assimilation - C₃, C₄ and CAM Pathways and its Significance; Respiration: Glycolysis, TCA cycle and Oxidative Phosphorylation.

UNIT IV

(13L)

Growth and Development:

Growth Curve and phases of growth; Phytohormones: Physiological Effect and Practical Applications - Auxin, Gibberellic acid, Cytokinin, Ethylene and Abscisic acid; Photoperiodism and Vernalization.

UNIT V

(14L)

Seed Dormancy:

Causes and Methods of Breaking Dormancy; Stress Physiology - Classification – Biotic and Abiotic, Stress Factors- Response of Plants to Salt, Drought, Frost and Heat.

REFERENCES:

- Devlin, R.M. (1969). *Plant Physiology*. Holt, Rinehart & Winston & Affiliated East West Press (P) Ltd., New Delhi.
- Dulsy Fatima, R.P. et. al., (1994). *Elements of Biochemistry*. Saras Publications, Nagercoil, Tamilnadu.
- Jain, V.K. (1990). *Fundamentals of Plant Physiology*. S. Chand & Co., New Delhi.
- Noggle, R. and Fritz (1989). *Introductory Plant Physiology*. Prentice Hall of India.
- Pandey, S.N. (1991). *Plant Physiology*. Vikas Publishing House (P) Ltd., New Delhi.
- Periyasamy, K. (1978). *Cell IyakkaViyal*(Cell Physiology). Tamilnadu text Book Society, Chennai.
- Salisbury, F.B. and Ross, C.W. (1999). *Plant Physiology*. CBS Publishers and Printers, New Delhi.

PRACTICALS

1. Water Potential by Gravimetric Method.
2. Water Potential by Falling Drop Method.
3. Osmotic Potential by Plasmolytic Method.
4. Rate of Photosynthesis in Different Concentrations of Bi-Carbonate – Bubble Method.
5. Measurement of Stomatal Index.
6. Effect of Temperature on Permeability of Plasma Membrane.
7. Separation of Chlorophyll Pigments by Ascending Paper Chromatography.

DEMONSTRATION:

1. Tissue Tension
2. Suction due to Transpiration
3. Ganong's Photometer
4. Fermentation
5. Arc Auxanometer
6. Clinostat
7. Phototropism

Spotters

1. Absorption Spectrum of Chlorophylls
2. Growth curve.

To maintain a record note book.

MSU/2017-2018/B.Sc. Botany/Semester-VI/Core Paper – 10

GENETICS, EVOLUTION AND BIOSTATISTICS

(5hrs/week)

Preamble:

LTPC

5 0 0 4

To learn the pattern of inheritance, to understand the mechanism of gene action, to learn the concept of biometrics and to become aware of the importance of statistical tools and computer applications in life sciences. The students will also learn about use of Statistics in the plant sciences which will be helpful to them during research.

UNIT-I

(18L)

Monohybrid and dihybrid cross & Polygenic inheritance:

Monohybrid and dihybrid cross, test cross, back cross, Mendel's laws, Deviation from Mendelian ratio— incomplete dominance, lethal factor, complementary factor, supplementary factor, duplicate and inhibitory. Polygenic inheritance- Inheritance of Wheat Kernel and Ear length in Maize.

UNIT-II

(18L)

Linkage & Sex determination:

Linkage, crossing over and recombination; Sex determination in plants; Extra nuclear inheritance - male sterility in corn; Population genetics - Hardy – Weinberg's principle.

UNIT-III

(18L)

DNA Model:

Watson and Crick, DNA as genetic material, DNA replication, Genetic code, Gene regulation in prokaryotes, Operon Concept, *Lac* Operon.

UNIT-IV

(18L)

Origin of life & Evolution:

Chemosynthetic theory—evidences (any five); Evolution: Evolutionary theories of Lamarck, Darwin, De Vries, Modern synthetic theory of evolution; Speciation – concept of species- Allopatric and Sympatric, Isolation mechanisms.

UNIT-V

(18L)

Measures of central tendencies & dispersion

Collection and interpretation of data. Measures of central tendencies - Mean, Mode and Median. Measures of dispersion - Standard Deviation, Chi-square test.

REFERENCES:

- Agarwal, V.K. (2000). *Simplified course in Genetics* (B.Sc., Zoology). S. Chand & Company Ltd., New Delhi.
- Ahluwalia, K.B. (1990). *Genetics*. Wiley Eastern Ltd., Madras.
- Chandrasekaran, S.N. and Parathasarathy, S.V. (1965). *Cytogenetics and Plant Breeding*. P. Varadhachari & Co., Madras.
- Gupta, P.K. (2000). *Genetics*. Rastogi Publishers, Meerut.
- Jain, H.K. (1999). *Genetics-Principles, Concepts & Implications*. Oxford & IBH Publishing Co., (P) Ltd., New Delhi.
- Lewin, B. (1990). *Genes IV*. Oxford University Press, Oxford.
- Palaniyappan, S. (1987). *Marabiyal* (Genetics - In Tamil). V.K. Publishing House, Madras.
- Pandey, B.P. (2012). *Cytology, Genetics and Molecular Genetics*. Tata McGraw-Hill Education Private Ltd., New Delhi.
- Genetics*. D. Van Nostrand Co., Ltd. Inc., New York.
- NageswaraRao, G. (1983). *Statistics for Agricultural Science*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Olive, J.D. (1995). *Basic Statistics - A Primer for the Biomedical Sciences*. John Wiley and Sons, New Delhi.
- Gottlieb, LD. and Jain, S.K. (1988). *Plant Evolutionary Biology*. Chapman & Hall, London.
- Shukla, R.S. and Chandel, P.S. (1996). *Cytogenetics, Evolution & Plant Breeding*. S. Chand & Company Ltd., New Delhi.
- Sproule, A. (1998). *Charles Darwin Scientists who have changed the world*. Orient Longmans, Hyderabad.
- Verma, P.S. and Agarwal, V.K. (1999). *Concepts of Evolution*. S. Chand & Company Ltd., New Delhi.

PRACTICALS :

1. Simple genetic problems in monohybrid crosses, incomplete dominance and lethal genes.
2. Simple problems on dihybrid ratio and interaction of factors.
3. Using available data, calculate the Mean and Standard deviation.
4. Spotters:
 - Linkage and Crossin z over
 - DNA model/ PhotographEvolution (Origin of life, Speciation).
5. To maintain a record note book.

MSU/2017-2018/B.Sc. Botany/Semester-VI/Core Paper – 11

PLANT ECOLOGY AND PHYTOGEOGRAPHY

(5hrs/week)

Preamble:

LTPC

5 0 0 4

To enable the students to understand biotic and abiotic factors in our ecosystem, to study the need of various ecosystems and vegetation. This course will enable the students to understand how environment influence the life of different organisms and vice versa.

UNIT – I

(14L)

Vegetation:

Biotic and abiotic factors and their influence on vegetation, a brief account of microbes, plants, animals, soil, wind, light, temperature, rainfall and fire. **Biogeochemical cycles** - Nitrogen and Carbon.

UNIT – II

(16L)

Ecosystem:

Concept, processes and component; Types of ecosystems – Aquatic and Forest; Ecological Classification of Plants; Morphological, anatomical and physiological adaptations of plants with special reference to Hydrophytes and Xerophytes

UNIT – III

(17L)

Autecology and Synecology:

Autecology and Synecology - Definition (Species, Population, Community); **Vegetation** – Units of vegetation- Formation, Association, Consociation; Society-development of vegetation; Migration- ecesis, colonization; Methods of study of vegetation- Quadrat and transect.

UNIT – IV

(15L)

Biomonitoring:

Biomonitoring - Biodegradation of Xenobiotics using microbe, Types of Bioremediation-*in situ* and *ex situ*, Phytoremediation, Biosensors and Bioindicators, Bioleaching.

UNIT – V

(13L)

Phytogeography:

Principles, continental drift and endemism. Centre of origin- paddy and tomato. Vegetations in Tamil Nadu, Remote Sensing.

PRACTICALS:

1. Analysis of herbaceous vegetation - by using quadrat and line transect method to find out frequency, density, abundance and interpret the vegetations in terms of Raunkiaer's frequency formula.
2. Morphological and anatomical adaptations of hydrophytes and xerophytes (each 2).

Hydrophytes: *Hydrilla, Nymphaea*

Xerophytes: *Nerium, Casuarina*

3. Maintain a Recordnote book.

REFERENCES:

- Singh, J.S., Singh, S.P. and Gupta, S. (2006) Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi
- Wilkinson, D.M. (2007). Fundamental Processes in Ecology. An Earth System Approach. Oxford.
- Daubenmier, R.F. (1970). Plants and Environment: A text book of Plant Autoecology, Wiley Eastern Private Limited
- Daubenmier, R.F. (1970), Plant Communities, Wiley Eastern Private Limited
- Odum, E. (2008) Ecology. Oxford and IBH Publisher.
- Sharma, P.D. (2010) Ecology and Environment, (8th Ed.) Rastogi Publications, Meerut.
- Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.

ALLIED BOTANY
MSU/2017-2018/B.Sc. Allied Botany/Semester I/111 Allied Paper – 1
PLANT DIVERSITY AND MEDICINAL BOTANY
(4hrs/week)

Preamble:

LTPC

4 0 04

The course facilitates an understanding of the salient features of various plant groups. Without the study of structural and functional aspects of Green plants, fungi, bacteria, viruses and their interrelationships, the “modern biology” is not possible. In fact, applied sciences, cannot replace basic sciences. The learners are expected to know the medicinal values of few plants.

UNIT – I (12L)

Algae& Fungi:

Algae:General characters and economic importance, Distribution, Structure and Life History of *Volvox*; Fungi:General characters and economic importance, Distribution, Structure and Life History of *Polyporus*.

UNIT – II (12L)

Lichens& Bryophytes:

Lichens:General characters and classification. Structure and Reproduction of *Usnea*; Bryophytes: General characters, Structure, Reproduction and Life History of *Funaria*.

UNIT – III (14L)

Pteridophytes& Gymnosperms:

General characters, Structure, Reproduction and Life History of *Lycopodium*;Gymnosperms:General characteristics, Structure, Reproduction and Life History of *Pinus*

UNIT – IV (12L)

Taxonomy:

Bentham and Hooker’s system of classification, Critical study of the following families: Rutaceae, Asclepiadaceae, Euphorbiaceae and Poaceae.

UNIT – V (10L)

Medicinal Botany:

Study of the following plants with reference to the morphology of the useful parts and their medicinal importance -*Aloe vera*, *Piper nigrum*, *Phyllanthusamarus*, *Coleus amboinicus*and *Catharanthusroseus*.

REFERENCES:

- Pandey, B. P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.
- Smith, G..
- Smith, G.M. (1955): Cryptogamic Botany Vol. II. (2nd Edition) (Bryophytes & Pteridophytes) Tata McGraw Hill Publishing Co., New Delhi.
- Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.
- Pandey, B. P. 2007. Botany for Degree Students: Diversity of Seed Plants and their Systematics, Structure, Development and Reproduction in Flowering Plants. S. Chand & Company Ltd, New Delhi.
- Rastogi, R. R. and B. N. Mehrotra. 1993. Compendium of Indian Medicinal Plants. Vol. I & Vol. II. CSIR, Publication and Information Directorate, New Delhi.

PRACTICALS :

1. Assign the given plant to its family giving reasons.
2. Dissect out and draw the floral parts of a plant belong to the families prescribed in the syllabus .
3. Make suitable micropreparations of Lycopodium stem, Pinus needle.
4. Identify and record the medicinal values and morphology of the useful parts of the plants prescribed in the syllabus.
5. Observe and identify the following specimens: Polyporus, Funaria, Lycopodium and Pinus –male and female cone.
6. Identify the slides showing mature anther, ovule, dicot embryo, Volvox, Nostoc, Yeast, Lycopodium - cone L.S and Funaria -capsule L.S.
7. To maintain a Record Note book

MSU/2017-2018/B.Sc. Allied Botany/ Semester II/IV Allied Paper – II
EMBRYOLOGY, PLANT ANATOMY, PHYSIOLOGY AND
BIOTECHNOLOGY
(4hrs/week)

Preamble:

LTPC

4 0 04

The course facilitates the student to know the mechanism underlining the shift from vegetative to reproductive phase and to trace the development of male and female gametophyte. It enable the students to study the structural and functional aspects of various tissue systems and organs of dicots and monocots and to understand the concepts involved in the function of plants and study the recent aspects of various physiological processes in plants, which also focuses on the use of recombinant DNA technology for crop improvement and to identify the molecular markers for selection of superior genotypes.

UNIT – I (13L)

Microsporangium & Mega sporangium:

Microsporangium: Structure and development; Megasporangium: Structure, types and development, Development of male and female gametophyte; Double fertilization; **Endosperm** – types, dicot embryo- Structure.

UNIT – II (12L)

Meristem & Tissues

Meristem: Structure and classification; Tissues: Simple and complex tissues, Primary structure of Dicot and Monocot stem and root, Normal secondary thickening in dicot stem.

UNIT – III (12L)

Absorption of water:

Absorption of water - diffusion, osmosis, imbibition; mechanism of absorption of water; Ascent of sap – (cohesion theory only); Transpiration – Types, Mechanism of stomatal transpiration (Starch – sugar hypothesis); Photosynthesis - Mechanism of Light and dark reaction (Calvin cycle).

UNIT – IV (11L)

Biofertilizer:

Biofertilizer: *Nostoc* - Morphology, Mass cultivation and use. **Yeast**: Structure, multiplication (budding and fission) and Mass culture.

UNIT – V (11L)

Tissue Culture:

Scope and importance, totipotency, Nutrient media (MS medium). Callus and Meristem Culture, Applications of plant tissue culture

- 1) Dissect out young embryo from *Tridax* flower bud.
- 2) Make suitable micro-preparations of dicot and monocot stem and root
- 3) Demonstrate the physiology experimental set up –Potato osmoscope, Ganong's lightscreen, Tissue tension.
- 4) Identify the Photograph/ Slide/ Specimen/setup - (i) *Nostoc* (ii) Yeast (iii) Callus culture, (iv) Meristem culture.
- 5) Maintain a record note book for external and internal evaluation.

NON-MAJOR ELECTIVES
MSU/2017-18/ B. Sc Botany / Semester –III
Non-Major Electives 1-(A)
GARDENING AND GARDEN MANAGEMENT
(2hrs/week)

Preamble:

LTPC
2 0 02

Enables the student to gain knowledge about crop production, plant propagation, plant breeding, genetic engineering, preparation of soil biochemistry and simultaneously can work in various fields including floral design, garden centers, teaching, fruit and vegetable production, arboriculture and landscape construction.

UNIT I **(6L)**

Gardens:

Gardens: Types – Formal & informal Gardens – English Gardens, Mogul Gardens, Japanese Gardens. Principles of Ornamental Gardening.

UNIT II **(6L)**

Propagation Techniques:

Soft Wood Cutting, Simple and Air Layering, ‘T’ Budding, Approach Grafting, Pruning. Garden Implements – Digger, Pruning Shears, Garden Rake.

UNIT III **(6L)**

Components of Ornamental Gardens:

Hedges, Edges, Flower Beds, Arches, Rockery, Lawn and Topiary.

UNIT IV **(6L)**

Vegetable Garden & Kitchen Garden Vegetable Gardening: Types; Kitchen Garden:

Establishment, Components– Perennials, Pandals, Fence, Seasonal vegetable crops in bunds, Compost Pits.

UNIT V **(6L)**

Indoor Gardening :

Indoor Gardening :Principles and Maintenance. Hanging baskets, Terrarium, Bottle Garden and Bonsai.

MSU/2017-18/ B. Sc Botany / Semester –III

Non-Major Elective1-(B)

HERBAL MEDICINE

(2hrs/week; Total 30hrs)

Preamble:

LTPC

2 0 02

Facilitates the role, importance and contributions of ethnomedicine, ethnoecology, ethno pharmacology, etc. in our modern civilization and create an awareness of link between biodiversity and cultural diversity. It will make the students realize the importance of People-Plant relations focusing upon impact of plant conservation and opportunities for sustainable use.

UNIT: I

(6L)Systems of medicine:

Indian systems of medicine –Ayurveda, Siddha, Unani and Homeopathy. TBK (Tribal Botanical knowledge): Folk medicines, including Home remedies. Ethno medicines of Tamil Nadu.

UNIT: II

(6L) Herbal

remedies:

Herbal remedies for common ailments like cold, fever, diabetes, cuts, diarrhoea.

UNIT: III

(6L)

Economic importance:

Study on the morphology, useful parts, uses and method of use for specific ailments of the following: rhizome (*Acorus*, Ginger), Bulb (Garlic, Onion), Root (*Hemidesmus*, *Vinca*), Bark (*Saracaindica*, *Cinnamomum*), Leaf (*Adhatoda*, *Vitex*), Flower (*Cassia*, *Clove*), Whole plant (*Phyllanthus*, *Azadirachta*).

UNIT: IV

(6L)

Herbals:

Skin and hair care using herbals. Herbal preparation: decoction, extract, infusions, oils, shampoos, powders.

UNIT: V

(6L)

Cultivation, harvest and post-harvest technology:

Cultivation, harvest and post-harvest technology of some medicinal plants –*Catharanthusroseus*, *Adhatodavasica*, *Acoruscalamus*

REFERENCES:

ArunaDevaraj, 2002.Herbal cosmetology.

Gala, D.R. Dhiren Gala & Sanjay Gala. 2000. Nature cure for common diseases, Navneet Publications Ltd., Mumbai.

Kirtikar K.R. and Basu, B.D. 1991.Indian Medicinal Plants Vol.1-4, Periodical Experts, New Delhi.

Saha, M.N. 1997. Fruit and Vegetable juice therapy, Jain Publishers-New Delhi.

VaidyaBhagwanDush, B. 1999. Herbal cure, Jain Publishers-New Delhi.

MSU/2017-18/ B. Sc Botany / Semester –IV
Non-Major Electives 1-(A)
FOOD AND NUTRITION
(2hrs/week)

Preamble:

LTPC
2 0 02

Facilitates understanding of the principles of food and nutrition. It provides the student to understand the nutritive values, importance, factors affecting storage and methods of preservation of food which make the students aware of application of different plants in various industries.

UNIT-I

(6L)

Food:

Energy Value of Food, Major Classes of Food- Carbohydrates, Proteins, Fats and Oils, Vitamins, Minerals – Sources and Requirements. Balanced Diet - Functions and Deficiency Symptoms – Causes and Prevention.

UNIT-II

(6L)

Plants as Source of Food:

Nutritive Value of Cereals and Millets (Rice, Wheat, Maize, Sorghum, and Ragi); Pulses (Bengal gram, Black gram, Green gram, Red gram and Peas); Nuts and Oil seeds (Ground nuts, Sesame, Coconut, Soyabeans, Sunflower); Fruits and Vegetables (Mango, Banana, Guava, Pomegranate, Grapes, Cucumber, Brinjal, Ladies finger, Tomato, Carrot).

UNIT: III

(6L)

Food Preservation:

Importance of Preservation. Methods of Preservation. Low and High Temperatures, Uses of Oil and Spices, Use of Salt and Sugar. Preparation of Jam, Jelly, Pickles and Squashes.

UNIT: IV

(6L)

Food Additives:

Food Additives - Definition and Types; Food Poisoning- Salmonellosis, Botulism; Food Adulteration- Harmful Effects, Simple Physical Tests for Detection of Food Adulterants.

UNIT: V

(6L)

Food borne Infection and their Prevention:

Food borne Infection and their Prevention - Cholera, Typhoid.

MSU/2017-18/ B. Sc Botany / Semester –IV
Non-Major Electives 1-(B)
BOTANY FOR COMPETITIVE EXAMINATION
(2hrs/week)

Preamble:

LTPC

2 0 02

Facilitates the basic principles of botany to the students which are vital for facing any competitive examinations.

UNIT I

(6L)

Basics of the Plant Kingdom :

Basics of the Plant Kingdom – Brief Classification of Plant Kingdom ; Diagnostic features of Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperms, Bacteria, Viruses; Economic importance of these Groups.

UNIT II

(6L)

Basics of Angiosperm Taxonomy:

A brief account of Natural System of Classification (Bentham and Hooker's System) and Phylogenetic System of Classification (Engler and Prantl's System). Binomial Nomenclature. A Brief account of the following Families and their Economic importance: Fabaceae, Cucurbitaceae, Poaceae.

UNIT III

(6L)

Medicinal Importance:

Medicinal Importance of the following Plants: *Zingiber officinale*, *Vetiveria zizanioides*, *Ocimum sanctum*, *Azadirachta indica*, *Solanum trilobatum*, *Phyllanthus emblica*, *Andrographis paniculata*, *Acalypha indica*.

UNIT IV

(6L)

Basics in Physiology:

Basics of Absorption of Water, Transpiration, Photosynthesis, Respiration, Protein Synthesis.

UNIT V

(6L)

Cell Organelles Genetics and Genetic Engineering:

Cell Organelles; Tissues and Tissue systems; An introduction to Genetics -Mendelism, Monohybrid cross and Dihybrid Cross; Genetic Engineering - Enzymes used in Gene Cloning experiments. An Introduction to Plant Tissue Culture; Biofertilizers.

MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI – 627012

B.Sc. Botany Degree
(CHOICE BASED CREDIT SYSTEM)

Learning Outcomes Based Curriculum Framework (LOCF) & Syllabus

Major & Allied Botany
(Effective from the academic year 2021-2022 onwards)

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc. Botany

(Choice Based Credit System)

(Effective from the academic year 2021-2022 onwards)

1. Preamble

Botany deals with the study of chemical and physical processes of living systems. Botany holds promises in areas of Zoology and Chemistry. The B.Sc. Degree programme aims at providing in-depth knowledge and understanding of the core principles of Botany and their practical aspects in order to pursue higher studies and employment. The Learning Outcomes Based Curriculum Framework (LOCF) for B.Sc. Botany programme has been framed as per the guidelines prescribed by University Grants Commission (UGC) under Choice Based Credit System (CBCS).

2. Vision

Excellent education in Botany to bring forth intellectual, personal and social wellbeing.

3. Mission

- Provide healthy learning environment to imbibe comprehensive knowledge, skills and values to bridge academia, industries and society.
- Promote research and open scientific platforms that transform students proficient and globally competent.
- Nurture moral values among students and help them grow as socially sensible and responsible persons.

Department of Botany Bachelor of Science in Botany			
Name of the Faculty handled:		No. of Students:	
Year: I	Semester: I	Semester: Odd/ Even	Academic year : 20__ - __

Score card for the mapping of CO-PO

Measuring Course Outcomes attained through University Examinations:

Attainment Level 1: 60% students scoring B Grade and above

Attainment Level 2: 70% students scoring A Grade and above

Attainment Level 3: 80% students scoring A⁺ Grade and above

Measuring Course Outcomes attained through Internal Exams:

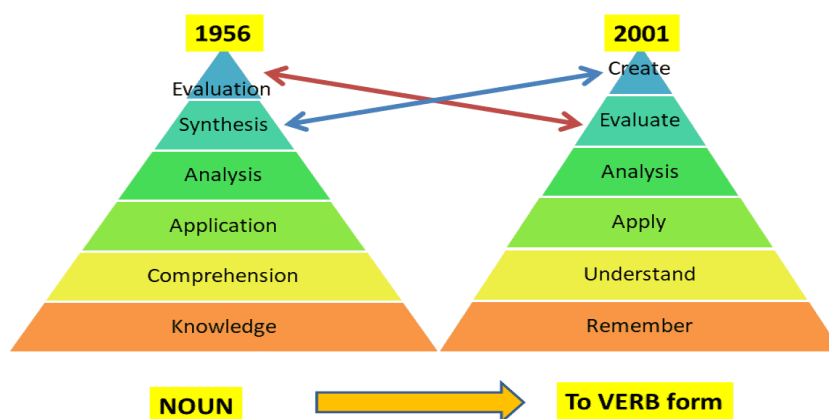
Attainment Level 1: 65% students scoring 32.5 and more marks out of 50

Attainment Level 2: 75% students scoring 37.5 and more marks out of 50

Attainment Level 3: 85% students scoring 42.5 and more marks out of 50

Course Outcomes	Tool	Percentage of students scoring more than the target	Attainment level	Attainment of Course Outcome	Course Outcome
CO1	Best INT- I (20%)	73.13%	1	(0.2x1) + (0.8 x 3)	2.6
	UNIV (80%)	80.59%	3		
CO2	Best INT- II (20%)	73.13%	1	(0.2x1) + (0.8 x 3)	2.6
	UNIV (80%)	80.59%	3		
CO3	Best INT- I (20%)	92.53%	3	(0.2x3) + (0.8 x 3)	3.0
	UNIV (80%)	80.59%	3		
CO4	Best INT- II (20%)	92.53%	3	(0.2x3) + (0.8 x 3)	3.0
	UNIV (80%)	80.59%	3		
CO5	Best INT- I (20%)	68.56%	1	(0.2x1) + (0.8 x 3)	2.6
	UNIV (80%)	80.59%	3		
CO6	Assignment				
CO7	Seminar				

Blooms Taxonomy Levels



List of Cognitive Levels and their codes given in the mapping

K: Knowledge

C: Comprehension

Ap: Application

An: Analysis

S: Synthesis

E: Evaluation

4. Programme Educational Objectives (PEOs)

B.Sc. Botany Programme Outcomes (PO's)

PEO1: Provide the fundamental knowledge on different branches of Botany.

PEO2: Impart the theoretical and practical skills in basic and modern techniques in Botany and related subjects.

PEO3: Motivate the students for critical thinking and self-reflection to draw conclusions

PEO4: Inculcate moral values and help them to grow as good citizens.

PEO5: Enable the students with profound understanding in various field of applications and make them competent.

5. Programme Outcomes (POs)

On completion of B.Sc. Botany programme, the student shall be able to

PO1. Basic Knowledge: Understanding of plant diversity and its significance in maintaining ecological equilibrium.

PO2. Inferential Knowledge: Students learn how to understand plant morphology and anatomy, plant identification, and vegetation analysis techniques in the field and in the laboratory.

PO3. Application Knowledge: Apply the knowledge of basic science, biological sciences, and plant fundamentals.

PO4. Analytical and Critical Knowledge: Prioritize exploration into current techniques and tools for biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue Culture trials, cellular and physiological assessments of plants, and review of its applications in human life.

PO5. Creative Knowledge: Develop and pivot in societal upliftment through tackling health, environmental challenges, food insecurity, and so on.

6. Programme Specific Outcomes (PSO)

On completion of B.Sc. Botany programme, the student shall be able to

PSO1. Understanding and identifying thoughts and arguments by gathering important plant related information in order to determine their place in classification systems and at the evolutionary level.

PSO2. Students will be able to search, categorise, compare, and link primary literature, choose works pertinent to a certain topic, and assess the scientific validity of these works in the field of Botany.

PSO3. Students will be able to compare and contrast the properties of many plant groupings, including algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms.

PSO4. Students will be able to explain the sole scientific explanation for the unity and variety of life on Earth using data from comparative biology.

PSO5. Students will be able to describe how plants work at the gene, genomic, cellular, and tissue levels.

PSO6. Students will be able to link environmental physical aspects to the structure of populations, communities, and ecosystems.

PSO7. Students will be able to comprehend the idea of artificial propagation of plants via vegetative methods and to find a livelihood *via* establishing miniature plant nurseries.

7. Eligibility for admission to the course and examination

Candidates shall be admitted to the course provided he/she has passed plus two examinations of the State or Central Board with Chemistry / Biology / Maths Biology / Agriculture as one of the subjects or any other Science subject that may be considered as equivalent by the M.S. University.

8. Duration of the Course

The students shall undergo the prescribed course of study for a period of not less than three academic years (Six semesters). Each semester contains 90 working days.

9. Medium of instruction and examination

The medium of instruction as well as examination will be in English.

10. Theory examination

The external evaluation will be based on the examination to be conducted by the university at the end of each semester.

11. Practical examination

Practical examinations will be conducted at the end of each semester.

12. Evaluation

A. Each paper carries an internal component

B. There is a pass minimum of 40% for external and overall components

Theory External: Internal Assessment = 75:25

Practical External: Internal Assessment = 50:50

C. Internal Assessment

Internal marks for Theory shall be allocated in the following manner.

The average of the best two tests from three compulsory tests	20 Marks
Assignment	05 Marks
Total	25 Marks

Note: Each test will be of one hour duration.

D. Practical

Internal marks for Practical shall be allotted in the following manner.

Experimental work	20 Marks
Record	10 Marks
Model Test	20 Marks
Total	50 Marks

13. Grading System

The performance of the student is indicated by the Seven Points Scale Grading System as per the UGC norms given below

Grade	Grade point	Percentage of marks	Performance
O	9.5 and above	95-100	Outstanding
E	8.5 and above	85-94	Excellent
D	7.5 and above	75-84	Distinction
A	7 and above	70-74	Very Good
B	6 and above	60-69	Good
C	5 and above	50-59	Average
RA	0	Up to 49	Re-Appear

F. The overall performance level of the candidates will be assessed by the following formulae:

$$\text{Cumulative weighted average of marks} = \frac{\Sigma(\text{marks} + \text{credits})}{\Sigma \text{credits}}$$

$$\text{Cumulative weighted average grade points} = \frac{\Sigma(\text{Grade points} \times \text{credits})}{\Sigma \text{credits}}$$

14. The question paper pattern for all theory papers shall be as follows.

Duration of Exam: 3Hours

Section	Type of questions	Mark
Part-A	Multiple choice question (Two question from each unit compulsory)	1×10=10 Marks
Part-B	Internal Choice questions (One question from each unit: either/or)	5×5=25 marks
Part-C	Internal Choice questions (One question from each unit: either/or)	8×5=40 marks
	Total	75 Marks

15. The question paper pattern for all practical papers shall be as follows.

Duration of Practical Exam: 3 hours

1	Major experiment	25
2	Minor Experiment	15
3	Spotters	05
4	Record	05
	Total	50 Marks

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI - 12
UG - COURSES - AFFILIATED COLLEGES
B.Sc. BOTANY
(CHOICE BASED CREDIT SYSTEM)
(With effect from the academic year 2021 - 2022 onwards)

Course Structure for B.Sc Botany Major (With effect from the academic year 2021 - 2022 onwards)							
Sem.	Part	Sub. No.	Subject Status	Subject Title	Course Paper	Hrs./ Week	Credits
I	I	1	Language	Tamil / Other Languages	1	6	4
	II	2	Language	Communicative English-I	1	6	4
	III	3	Core I	Algae and Bryophytes	1	4	4
	III	4	Major Practical I	Algae and Bryophytes - Practical	1	2	2
	III	5	Add on Major (Mandatory)	Professional English for Life Sciences - I	1	4	4
	III	6	Allied I	Plant Diversity and Medicinal Botany	1	4	3
	III	7	Allied Practical I	Plant Diversity and Medicinal Botany-Practical	1	2	2
	IV	8	Common	Environmental Studies	1	2	2
				Sub Total	8	30	25
II	I	9	Language	Tamil / Other Languages	1	6	4
	II	10	Language	Communicative English-II	1	6	4
	III	11	Core II	Plant Anatomy and Micro-Techniques	1	4	4
	III	12	Major Practical II	Plant Anatomy and Micro-Techniques -Practical	1	2	2
	III	13	Add on Major (Mandatory)	Professional English for Life Sciences - II	1	4	4
	III	14	Allied II	Embryology, Plant Anatomy, Physiology and Biotechnology	1	4	3
	III	15	Allied Practical II	Embryology, Plant Anatomy, Physiology and Biotechnology - Practical	1	2	2
	IV	16	Common	Value Based Education / சமூக ஒழுக்கங்களும் பண்பாட்டு விழுமியங்களும் / Social Harmony	1	2	2
				Sub Total	8	30	25

Sem.	Part	Sub. No.	Subject Status	Subject	Course Paper	Hrs./ Week	Credit
III	I	17	Language	Tamil	1	6	4
	II	18	Language	English	1	6	4
	III	19	Core III	Fungi, Plant Pathology and Lichenology	1	4	4
	III	20	Major Practical III	Fungi, Plant Pathology and Lichenology - Practical	1	2	2
	III	21	Allied – I Paper I		1	4	3
	III	22	Allied Practical I	Practical	1	2	2
	III	23	Skill Based	Mushroom Culture Technology - I(A)	1	4	4
				Organic Farming - I(B)			
	IV	24	Non-Major Elective I	Gardening and Garden Management - I(A)	1	2	2
				Herbal Medicine - I(B)			
IV		Common	Yoga	-	-	2	
			Sub Total	8	30	27	
IV	I	25	Language	Tamil	1	6	4
	II	26	Language	English	1	6	4
	III	27	Core IV	Pteridophytes, Gymnosperms and Paleobotany	1	4	4
	III	28	Major Practical IV	Pteridophytes, Gymnosperms and Paleobotany - Practical	1	2	2
	III	29	Allied II - Paper II		1	4	3
	III	30	Allied Practical II	Practical	1	2	2
	IV	31	Skill Based	Floriculture - I(A)	1	4	4
				Preservation of Fruits and Vegetables - I(B)			
	IV	32	Non-Major Elective II	Food and Nutrition - II(A)	1	2	2
				Botany for Competitive Examination - II(B)			
	IV		Common	Computers for Digital Era	-	-	2
	V	33	Extension Activities	NCC / NSS / YRC / YWF	-	-	1
				Sub Total	8	30	28

Sem.	Part	Sub. No.	Subject Status	Subject	Course Paper	Hrs./ Week	Credit
V	III	34	Core V	Cell Biology and Embryology of Angiosperms	1	5	4
	III	35	Core VI	Morphology and Taxonomy of Angiosperms	1	5	4
	III	36	Core VII	Biochemistry and Bioinformatics	1	5	4
	III	37	Elective - I	Plant Ecology and Phytogeography - I(A)	1	5	4
				Marine Biotechnology - I(B)			
	III	38	Major Practical - V	Cell Biology, Embryology, Morphology and Taxonomy of Angiosperms - Practical	1	2+2	2
	III	39	Major Practical VI	Biochemistry, Bioinformatics and Elective – I Practical	1	2+2	2
	IV	40	Skill Based Common	Personality Development	1	2	2
Effective Communication							
Youth Leadership							
			Sub Total	7	30	22	
VI	III	41	Core VIII	Genetics, Evolution and Biostatistics	1	5	4
	III	42	Core IX	Plant Physiology	1	5	4
	III	43	Core X	Microbiology	1	4	4
	III	44	Elective I	Horticulture and Plant Breeding - I(A)	1	4	4
				Forestry - I(B)			
	III	45	Elective II	Plant Biotechnology and Genetic Engineering - II(A)	1	4	4
				Environmental Biotechnology - II(B)			
	III	46	Major Practical VII	Genetics, Evolution, Biostatistics and Elective - I Practical	1	2+1	2
	III	47	Major Practical VIII	Plant Physiology - Practical	1	2	2
	III	48	Major Practical IX	Microbiology and Elective II - Practical	1	2+1	2
				Sub Total	8	30	26

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - I
CORE PAPER – III: ALGAE AND BRYOPHYTES
(4 hrs / week)

UNIT – I **12 Hours**
General characters and classification of Algae based on Fritsch (1945), life cycle patterns of Algae, systematic position, distribution, structure, reproduction and life history of *Volvox* and *Caulerpa*.

UNIT – II **12 Hours**
Systematic position, distribution, structure, reproduction and life history of *Chara*, *Sargassum* and *Gracilaria*.

UNIT – III **12 Hours**
Seaweed cultivation - *Gracilaria*; Methods of extraction and uses of agar-agar and carrageenin; Economic importance of Algae.

UNIT – IV **12 Hours**
Morphology, mass culture and nutritive importance of *Spirulina*; Morphology, mass culture and economic importance of *Nostoc*.

UNIT – V **12 Hours**
General characters and classification of Bryophytes by Rothmaler (1951); systematic position, distribution, structure, reproduction and life history of Marchantia.

REFERENCES:

1. Dubey R.C. 1993 A text book of bio-technology S.Chand & Comp. Ltd., New Delhi.
2. Fritsch F.E. 1972. The structure and reproduction of Algae Vol. I & II
3. Kamat N.D. 1982. Topics in algae, Sai Kraipa Prakashan Aurangabad.
4. Kumar H.D & Singh H. N. 1982 A Text book of Algae East West Press Pvt. Ltd New Delhi.
5. Pandey S.N & Trivedi P.S. 1977. Text book of Botany Vol I - Vikas Publishing House J Pvt. Ltd., New Delhi.
6. Parihar N.S. 1967. Bryophyta-Central Book Depot Publications in Botany, Allahabad.
7. Sharma O.P. 1986. Text Book of Algae. Tata Me Graw- Hill Publications. New Delhi,
8. Vashista B.R. 1997. The Algae, S. Chand & Co, New Delhi.
9. Venkatraman. 1969. The cultivation of Algae-Indian council of Agricultural Research - New Delhi.
10. Watson E.V. 1974. Structure and life cycle of Bryophytes- B.I. Publications New Delhi.

ALGAE AND BRYOPHYTES - PRACTICAL

1. Study of Morphology of the Algae and Bryophytes prescribed in the syllabus.
2. Make suitable micro preparations of the following: a. Caulerpa – Rhizome; b. Sargassum - Stipe, leaf; c. Gracilaria - Thallus with cystocarp; d. Marchantia - Thallus.
3. Observe and identify the microslides
 - a) Volvox - Vegetative colony, colony with daughter colonies and sex organs.
 - b) Chara - Sex organs
 - c) Sargassum - Male and female conceptacles
 - d) Gracilaria - Thallus with cystocarp.
 - e) Marchantia - V.S of Gemma cup, V.S of Antheridiophore,
 - f) V.S of Archegoniophore, V.S of Sporophyte
 - g) Algal Slides / Tablet - Spirulina, Nostoc; BGA-fertilizer (packet);
4. Field trip of minimum one day.

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the general characters and classification and lifecycle of Algae.	PO1, PO2	PSO1, PSO2	C
CO. 2	To comprehend Algae systematic position, structure, reproduction, and economic significance.	PO2, PO3	PSO3, PSO4	K, C
CO. 3	To examine and analyse various plant Seaweed cultivation and describe about their economic importance of Algae	PO3, PO4, PO5	PSO5, PSO6	An
CO. 4	To examine and analyse various plant mass culture and describe about their economic importance.	PO3, PO4, PO5	PSO5, PSO6	An
CO. 5	To understand the general characters and classification and lifecycle of Bryophytes.	PO4, PO5	PSO6, PSO7	Ap, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

ALGAE AND BRYOPHYTES												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	3	2
2	3	3	2	3	2	3	3	3	2	2	3	2
3	2	3	2	3	2	2	2	3	2	2	3	2
4	2	3	2	3	2	2	2	3	2	3	2	1
5	2	3	3	3	2	1	3	2	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER – I - Allied - I
PLANT DIVERSITY AND MEDICINAL BOTANY
(4 hrs / week)

UNIT – I

12 Hours

General characters and economic importance of Algae - Distribution, Structure and Life History of Volvox; General characters and economic importance of Fungi - Distribution, Structure and Life History of Polyporus.

UNIT – II

12 Hours

General characters and classification of Lichens; Structure and Reproduction of Usnea. General characters of Bryophytes; Structure, Reproduction and Life History of Funaria.

UNIT – III

12 Hours

General characters of Pteridophytes; Structure, Reproduction and Life History of Lycopodium. General characteristics of Gymnosperms; Structure, Reproduction and Life History of Pinus,

UNIT – IV

12 Hours

Bentham and Hooker's system of classification; Critical study of the following families: Rutaceae, Asclepiadaceae, Euphorbiaceae and Poaceae.

UNIT – V

12 Hours

Study of the following plants with reference to the morphology of the useful parts and their medicinal importance: Aloe vera, Piper nigrum, Phyllanthus amarus, Coleus amboinicus and Catharanthus roseus,.

REFERENCES:

1. Chapman, V.J & Chapman, D.J. Elbs and Macmillian. 1960.
2. The Algae, Chamberlain C.J. 1986. Gymnosperm, structure and Evolution CBS Publishers and Distributors, Delhi.
3. Chopra, R.N. and Kumar, P.K. 1988. Biology of Bryophytes, Wiley Eastern Ltd., New Delhi.
4. Kokate, C.F. Purohit, A.P. and Gohale, S.R. 2004. Pharmacognosy, Nirali Prakashan, New Delhi.
5. Pandey, B.P. 1997. Taxonomy of Angiosperms, S. Chand and company Ltd., New Delhi.
6. Rashid, A. 1976. An Introduction to Pteridophytes, Vikas Publishing House, New Delhi.
7. Vashista, B.R. 1990. Botany for Degree Students, Fungi S. Chand and Co., Ltd., New Delhi.

**MSU/2021-2022 UG-Colleges/Part-III (B.Sc. Botany)/Semester-I /Allied Practical-I
PLANT DIVERSITY AND MEDICINAL BOTANY – PRACTICAL**

1. Assign the given plant to its family, giving reasons.
2. Dissect out and draw the floral parts of the plants belong to the families prescribed in the syllabus.
3. Make suitable micropreparations of Lycopodium stem, Pinus needle.
4. Identify and record the medicinal values and morphology of the useful parts of the plants prescribed in the syllabus.
5. Observe and identify the following specimens: Polyporus, Funaria, Lycopodium and Pinus -male and female cone.
6. Identify the slides showing Volvox. Nostoc, Yeast, Lycopodium - cone L.S and Funaria -capsule L.S.

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the general characters and economic importance classification and lifecycle of Algae and fungi.	PO1, PO2	PSO1, PSO2	C
CO. 2	To understand the general characters and economic importance classification and lifecycle of Lichens and Bryophytes.	PO2, PO3	PSO3, PSO4	K, C
CO. 3	To understand the general characters and economic importance classification and lifecycle of Pteridophytes and Gymnosperms.	PO2, PO3	PSO3, PSO4	K, C
CO. 4	To understand the general characters and economic importance classification and Taxonomy of Angiosperms with selected families.	PO3, PO4, PO5	PSO5, PSO6	An
CO. 5	To morphology of the useful parts and their medicinal and economic importance.	PO4, PO5	PSO6, PSO7	Ap, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

Core – 1: PLANT DIVERSITY AND MEDICINAL BOTANY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	2	3	3	2	3	3	2	3	3	3	3	2
2	2	2	3	2	2	3	3	3	2	2	3	2
3	2	2	3	2	2	3	3	3	2	2	3	2
4	3	3	2	2	3	3	2	3	2	1	3	3
5	2	3	2	1	3	3	2	3	2	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/ 2021-2022 UG-Colleges /Part-III (B.Sc. Botany) / Semester-II/ Core –II
PLANT ANATOMY AND MICRO TECHNIQUES
(4 hrs / week)

UNIT – I **12 Hours**
Meristems - Characteristics of meristematic tissues - Types, functions and Theories of meristems. Structure and functions of simple and permanent tissues - parenchyma, collenchyma, sclerenchyma, xylem and phloem.

UNIT – II **12 Hours**
Structure of dicot stem and root, structure of monocot stem and root, structure of dicot and monocot leaves.

UNIT – III **12 Hours**
Normal secondary thickening in dicot stem and root, anomalous secondary growth in the stem of *Boerhaavia* and *Dracaena*.

UNIT – IV **12 Hours**
Nodal anatomy: Types of nodes - unilocular, trilocular and multilocular; leaf traces and leaf gaps, epidermis tissue system: stomatal types, hair, trichomes and glands

UNIT – V **12 Hours**
Microscopy: Principle and working of simple and compound light microscopes and electron microscope (TEM only). Micro techniques - simple staining, double staining and preparation of permanent slides - Maceration

REFERENCES:

1. Cutter, 1978 - Plant Anatomy, Edward Arnold publishers, London,
2. Eames, A.J 1991-Morphology of Angiosperms. Mc Graw Hill Pub., New Delhi.
3. Esau, K.1953-PlantAnatomy, WileyPub. Co. Newyork.
4. Fahn, A. 1987- Plant Anatomy, Maxwell House New York.
5. Johansen,D.A 1940 -Plant Microtechnique. Mc Graw Hill Book Company Inc. New york.
6. Pandey B.P 1982-Plant Anatomy -S. Chand & company Ltd., New Delhi.
7. Vashista, B.R 1997 -The Plant Anatomy R. Chand & co. New Delhi.

**MSU/ 2021-2022 UG-Colleges /Part-III (B.Sc. Botany) / Semester-II/ Major Practical - II
PLANT ANATOMY AND MICRO TECHNIQUES – PRACTICAL**

1. To observe and identify the following slides showing
 - a) Meristems - shoot apex and root apex
 - b) Simple tissues
 - c) Xylem elements
2. Primary structure of stem, root and leaves of dicot and monocot plant.
3. Normal secondary thickening in dicot stem and root.
4. Anomalous secondary growth in Boerhaavia and Dracaena.
5. Maceration technique (Xylem elements only)
6. Demonstration: Preparation of double stained permanent slides.

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the Meristems – Characteristics and Types, functions and Structure and functions of simple and permanent tissues.	PO1, PO2	PSO1, PSO2	C
CO. 2	To comprehend structure of dicot, monocot stem and root, structure of dicot and monocot leaves.	PO2, PO3	PSO3, PSO4	K, C
CO. 3	To normal secondary thickening in dicot stem and root, anomalous secondary growth.	PO2, PO3	PSO3, PSO4	K, C
CO. 4	To examine and analyse various plant Nodal anatomy: Types of nodes and describe about their leaf traces and leaf.	PO3, PO4, PO5	PSO5, PSO6	An
CO. 5	To appraise the Microscopy and their application and Micro techniques – staining types and preparation of permanent slides – Maceration.	PO4, PO5	PSO6, PSO7	Ap, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

PLANT ANATOMY AND MICRO TECHNIQUES												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	2	2	3	2	3	3	2	2	3	2
2	2	3	3	3	2	2	3	3	2	3	3	2
3	2	3	2	3	2	3	3	2	2	2	3	2
4	3	3	2	3	2	2	3	2	2	2	3	2
5	2	3	3	3	2	2	3	2	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/ 2021-2022 UG-Colleges /Part-III (B.Sc. Botany) / Semester-II / Allied -II
Semester II / IV
EMBRYOLOGY, PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY
(4 Hrs / Week)

UNIT – I **12 Hours**
Structure and development of microsporangium; Structure, types and development of megasporangium; Development of male and female gametophyte; Double fertilization, Endosperm - types. Structure of dicot embryo.

UNIT – II **12 Hours**
Meristem - Structure and classification. Simple tissues, complex tissues; Primary structure of Dicot and Monocot stem and root; Structure of leaf; Normal secondary thickening in dicot stem.

UNIT – III **12 Hours**
Absorption of water - diffusion, osmosis, imbibition, mechanism of absorption of water; Ascent of sap - (cohesion theory only); Transpiration - Types, Mechanism of stomatal transpiration (Starch - sugar hypothesis); Photosynthesis - importance of photosynthesis, Mechanism of Photosynthesis - Light and dark reaction (Calvin cycle).

UNIT – IV **12 Hours**
Nostoc - Morphology, Use as Biofertilizer and Mass cultivation; Structure, multiplication (budding and fission) and Mass culture of Yeast.

UNIT – V **12 Hours**
Tissue Culture - Scope and importance - totipotency. Nutrient media (M.S medium) Callus and Meristem Culture; Applications of plant tissue culture.

REFERENCES:

1. Bojwani, S.S and Bhatnagar, S.P. 1987. The Embryology of Angiosperms, VikasPublications, New Delhi.
2. Dubey, R.C. 2002. A text Book of Biotechnology, S.Chand and Co; New Delhi
3. Jain, V.K. 2001. Fundamentals of Plant Physiology, S. Chand and Co; New Delhi
4. Pandey, B.P. 2002. Plant Anatomy, S. Chand and Co; Ram Nagar, New Delhi
5. Pandey, K.K. Sinha, B.K. 1988. Plant Physiology, Vikas Publications, New Delhi

MSU/ 2021-2022 UG-Colleges/Part-III (B.Sc, Botany) / Semester - II/

Allied Practical-II

PRACTICAL - II

**EMBRYOLOGY, PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY-
PRACTICAL**

1. Dissect out young embryo from Tridax flower bud.
2. Make suitable micro-preparations of dicot and monocot stem, root and leaf.
3. Demonstrate the physiology experimental set up - Potato osmoscope, Ganong's light screen, Bell jar experiment.
4. Identify the Photograph/Slide/Specimen/setup slides showing mature anther, ovule, dicot embryo, (i) Nostoc (ii) Yeast (iii) Callus culture, (iv) Meristem culture.
5. Maintain a record note book for external and internal evaluation.

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the structure and development of microsporangium and megasporangium and Endosperm – types.	PO1, PO2	PSO1, PSO2	C
CO. 2	To meristem - structure and classification and Primary structure of Dicot and Monocot stem and root; Structure of leaf.	PO2, PO3	PSO3, PSO4	K, C
CO. 3	To examine and analyse absorption of water and Ascent of sap and Transpiration and Photosynthesis.	PO2, PO3	PSO3, PSO4	An
CO. 4	To examine and analyse Morphology, Use as Biofertilizer and Mass cultivation	PO3, PO4, PO5	PSO5, PSO6	An
CO. 5	To appraise the Tissue Culture - Scope and importance and Nutrient media review their economic importance.	PO4, PO5	PSO6, PSO7	Ap, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

EMBRYOLOGY, PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	2	2	3	3	2	2	3	3	3	3	2	2
2	2	1	3	2	2	3	3	3	3	3	2	2
3	2	1	3	2	1	3	3	1	3	3	2	1
4	2	2	3	2	1	3	3	1	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation

MSU/ 2021 - 2022 UG – Colleges/Part – III (B.Sc. Botany)
SEMESTER -III
CORE PAPER – III. FUNGI, PLANT PATHOLOGY AND LICHENOLOGY
(4 hrs/week)

Objectives:

- To know the structure and economic importance of Fungi
- To identify the symptoms of Plant pathogens
- To know the structure and importance of Lichens

L	T	P	C
0	0	2	2

UNIT – I

12 Hours

General classification and characters of Fungi proposed by Alexopoulos and Mims (1979). Occurrence, systematic position, structure, reproduction and life cycle of *Albugo* and *Aspergillus*.

UNIT – II

12 Hours

Occurrence, systematic position, structure, reproduction and life cycle of *Peziza* and *Puccinia*. Economic importance of Fungi-Role of Fungi in medicine, industry, agriculture, food and food products.

UNIT – III

12 Hours

Study of the following plant diseases with special reference to the symptoms, etiology, dissemination and control measures: Tikka disease of ground nut, Red rot of sugar cane, Paddy blast.

UNIT – IV

12 Hours

Study of the following plant diseases with special reference to the symptoms, etiology, dissemination and control measures: Citrus canker, Bunchy top of Banana and Tobacco Mosaic virus.

UNIT – V

12 Hours

Lichens: General account - Classification – Structure – Reproduction – Economic importance of Lichens. Type study: *Usnea*.

PRACTICALS

1. Micro preparation and identification of *Peziza*, *Puccinia* and *Lichen* thallus

2. Spotters:

i. Slides – *Albugo*-conidia, *Aspergillus* – conidia, *Peziza* -V.S. of apothecium, *Puccinia*-uredosorus and Teleutosorus, Lichen – V.S. of apothecium.

ii. Disease infected leaves showing *Albugo*, *Puccinia*, *Usnea* – Habit.

iii. Observe and identify the following Plant diseases.

- a. Tikka disease of Ground nut
- b. Red rot of Sugarcane
- c. Paddy Blast

- d. Citrus canker
 - e. Bunchy Top of Banana
 - f. Tobacco Mosaic Virus – disease
3. To maintain a record notebook for external evaluation.

REFERENCES

1. Alexopolous, C.J, Mims, C.W and Blackwell, M. 1996. Introductory Mycology, John Wiley and Sons, NewYork.
2. Dube, H.C. 2005. An Introduction to Fungi. Vikas Publishing House, New Delhi.
3. Mehrotta, R.S. 2000. Plant Pathology. Tata Mc Graw Hill Publishing Co. New Delhi.
4. Rangaswamy, G. 1992. Diseases of Crop Plants in India. Prentice Hall of India, New Delhi.
5. Sharma, O.P. 1986. Text Book of Fungi. Tata Mc Graw Hill Publishing Co., Ltd., New Delhi.
6. Sing, R.S. 1991. Plant diseases Oxford IBH, New Delhi.
7. The Biology of Lichens: Hale, M.E; Edward Arnold, Mayland 1983.
8. Vashista, B.R. 1990. Botany for Degree students – Fungi. S.Chand and Co., New Delhi
9. Vashista P.C; 1998. Plant Pathology – Pradeep Publication, Jalandhar.

<https://www.youtube.com/watch?v=pA5AELdA2og>
<https://www.youtube.com/watch?v=aLcD1GaOr4g>
https://www.youtube.com/watch?v=IMge9kF0M_Q
<https://www.youtube.com/watch?v=AYNQuSCXVec>
<https://www.youtube.com/watch?v=B-ZADT2RhkM>
https://www.youtube.com/watch?v=KAlvzK_391s
<https://www.youtube.com/watch?v=WbRGi7dReM8>
<https://www.youtube.com/watch?v=9jErPHfGz7s>
<https://www.youtube.com/watch?v=a5VhAILNhU>
<https://www.youtube.com/watch?v=tOZlcuP2xso>

B.Sc Botany Programme Course Outcome (CO's)
MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - III
CORE PAPER – III. FUNGI, PLANT PATHOLOGY AND LICHENOLOGY
(4 hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the classification and lifecycle of fungi.	PO1, PO2	PSO1, PSO2	C
CO. 2	To comprehend fungi's systematic position, structure, reproduction, and economic significance.	PO2, PO3	PSO3, PSO4	K, C
CO. 3 & 4	To examine and analyse various plant diseases and describe about their control measures	PO3, PO4, PO5	PSO5, PSO6	An
CO. 5	To appraise the lichens and their classification and review their economic importance.	PO4, PO5	PSO6, PSO7	Ap, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

FUNGI, PLANT PATHOLOGY AND LICHENOLOGY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	2	2	3	3	2	2	3	3	3	3	2	2
2	2	1	3	3	2	2	3	3	2	2	3	2
3	2	1	3	3	2	1	3	3	2	1	3	1
4	3	3	3	3	2	1	3	3	2	1	3	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU/2021 - 2022 UG – Colleges/Part-III (B.Sc. Botany)
SEMESTER-III
SKILL BASED SUBJECT – I (A)
MUSHROOM CULTURE TECHNOLOGY
(4hrs/week)

Objective:

- The subject enables the students
- To understand, appreciate, and develop self-confidence for involving self-employment.
- To identify the edible and poisonous mushroom.
- To learn the economic factors associated with mushroom cultivation.
- To gain knowledge on post harvesting procedures and preparation of recipes.

L	T	P	C
0	0	2	2

UNIT – I

13 Hours

Introduction, Nutritional and medicinal value of Edible mushrooms, poisonous mushroom, Structure and Life cycle of Edible Mushroom - *Pleurotus* species. *Agaricus bisporus*, *Volvariella volvacea*. Prospects of mushroom cultivation in small scale industry.

UNIT – II

14 Hours

Mushroom Cultivation Technology - Infrastructure, substrates (locally available), Polythene bag, vessels, Inoculation hook, inoculation loop, mushroom unit (thatched house), water sprayer. Pure culture- Preparation of Medium (PDA and Oat Meal Agar Medium, Sterilization methods, Preparation of Test Tube slants to store mother culture. Culturing of *Pleurotus* mycelium on Petri plates, preparation of mother spawn in Saline bottle and Polypropylene Bag and their multiplication

UNIT- III

11 Hours

Factors affecting the Mushroom bed preparation, spawn running and harvesting of Mushrooms - Button mushroom (*Agaricus bisporus*). Oyster mushroom (*Pleurotus* sp.) and Paddy Straw Mushroom (*Volvariella* sp.)

UNIT – IV

11 Hours

Post Harvesting Technology - Farm Design and protection of Mushrooms from Pests and Diseases. Nutritional Value - Proteins, Amino acids, Mineral elements. Carbohydrates, Fibre content and Vitamins. Significance of Mushrooms.

UNIT – V

10 Hours

Storage and Food Preparation - Short term storage (Refrigeration - up to 24 hours), Long term storage (Canning, Pickles, Papads), Drying, storage in salt solutions. Value added Food preparation: Types of Food prepared from Mushroom: Soup, Cutlet, Omelette, Samosa. Pickles, Curry.

PRACTICALS

- Demonstration
- Identification of edible mushrooms
- Cultivation of Paddy Straw Mushroom
- Preparation of recipes
- To maintain a record notebook for external evaluation.

REFERENCES

1. Bahl, N. (1984-1988). Hand book of Mushrooms, II Edition, and Vol. I & Vol. II.
2. Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan, R. (1991). Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
3. Swaminathan, M. (1990). Food and Nutrition. Bappco. The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
4. Tewari, P and Kapoor, S.C., (1998). Mushroom cultivation. Mittal Publications, Delhi.

<https://www.youtube.com/watch?v=o4Z8CkChoZQ>

<https://www.youtube.com/watch?v=48yxiUrZrrM>

<https://www.youtube.com/watch?v=9JwkHjCTKtQ>

<https://www.youtube.com/watch?v=7b9MPjIDVj8>

<https://www.youtube.com/watch?v=AuxBrMXBXdc>

<https://www.youtube.com/watch?v=9J31WXxAEWY>

Core course 2 Code: BO2CRT02
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
SKILL BASED SUBJECT – I (A)
MUSHROOM CULTURE TECHNOLOGY
(4hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To discuss about nutritional and medicinal value of mushroom and their lifecycle	PO1, PO2, PO3	PSO1, PSO2, PSO3	C, An
CO. 2	To demonstrate and transfer knowledge about the Mushroom Cultivation Technology	PO2, PO3, PO4	PSO2, PSO3	C, Ap
CO. 3	To appraise the harvesting methods of mushroom.	PO4	PSO4, PSO5	C, An
CO. 4	To criticize and illustrate about the protection techniques involved in mushroom cultivation	PO4, PO5	PSO5	E, C
CO. 5	To understand the storage and preparation of food from mushroom	PO5	PSO6, PSO7	K, C

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

MUSHROOM CULTURE TECHNOLOGY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	3	3	2	2	3	3	3	3	2	2
3	3	3	3	3	2	1	3	3	3	3	2	2
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	1

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
SKILL BASED SUBJECT - I (B) ORGANIC FARMING
(4hrs / week)

Objectives:

- To enable the students to understand the role of organic manures in the improvement of soil fertility.
- To become aware of the importance of Biofertilizers, Green leaf manure, etc.,
- To learn the significance of Vermicompost and Panchagavya.

L	T	P	C
0	0	2	2

Unit – I

15 Hours

Soil types based on texture, Formation of soil, Properties - Physical and Chemical, Soil profile, Fertility of soil, Water retentivity, Reclamation of acidic and alkaline soil.

Unit – II

13 Hours

Organic manure: Farmyard manure, Cow dung, Cow urine, Green leaf manure, Poultry wastes and Fishery wastes.

Unit – III

10 Hours

Humus formation, Composting methods, Advantages of composting, Mulching and its advantages.

Unit – IV

12 Hours

Biofertilizers - Importance of biofertilizers, Rhizobium - Importance, mass production and application; *Azolla* - Importance, mass production and application.

Unit – V

10 Hours

Vermicomposting - Importance, Production of vermicompost-pit method and heap method and Application of vermicompost. Panchagavya - Importance, preparation and application of Panchagavya.

REFERENCES:

1. Dubey. R.C., 2006, A Text Book of Biotechnology. S.Chand and Company Ltd., New Delhi.
2. John Jothi Prakash. E., 2006, Outlines of Biotechnology, Emkay Publications, New Delhi.
3. Mark Coyone., 2004, Soil microbiology - An Exploratory Approach, Delmar Publishers, Singapore.
4. Miller, C.E. and Turk, L.M., 2002, Fundamentals of soil Science, Biotech Books, Delhi.

<https://www.youtube.com/watch?v=Ctn1hmv-Rck>

<https://www.youtube.com/watch?v=B89RpXITJ5I>

<https://www.youtube.com/watch?v=aRyzvqjHxFA>

<https://www.youtube.com/watch?v=j-L-zzI5oQQ>

<https://www.youtube.com/watch?v=6Ejq4pbANww>

<https://www.youtube.com/watch?v=uRINsnnUqsl>

Core course 3 Code: BO3CRT03
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
SKILL BASED SUBJECT - I (B) ORGANIC FARMING
(4hrs / week)
(Theory 54hrs; Practical 36 hrs; Credits 3+1)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To study about the description and types of soil	PO1, PO2	PSO1, PSO2, PSO3	K, C
CO. 2	To infer about the preparation of organic manures	PO3, PO4	PSO4, PSO5	An, K
CO. 3	To sketch and illustrate the advantages of composting.	PO4	PSO4, PSO5	E
CO. 4	To criticize and realize the importance of bio-fertilizers	PO4	PSO6, PSO7	Ap, An
CO. 5	To grade and develop about the importance and preparation of vermin-composting and punchagavya	PO4, PO5	PSO6, PSO7	An, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis ; E: Evaluation

Mapping

ORGANIC FARMING												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	3	3	2	2	3	3	3	3	2	2
3	3	3	3	3	2	1	3	3	3	3	2	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - IV
CORE PAPER–IV: PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY
(4 hrs / week)

Objectives:

- To understand the structural organization and developmental study of Pteridophytes and Gymnosperms.
- To learn about evolutionary trends, students aware of the Preservation of Plant life of the Geological Period.

L	T	P	C
0	0	2	2

UNIT – I **12 Hours**
Pteridophytes: General characteristics and Classification of Pteridophytes (Sporne 1966), *Psilotum* and *Lycopodium*: Distribution, Systematic Position, Structure, Reproduction and Life History (Need not study the development of gametophyte, sex organ and sporophyte).

UNIT – II **12 Hours**
Selaginella, *Adiantum*: Occurrence, Systematic Position, Structure, Reproduction and Life Cycle (Need not study the development of gametophytes, Sex organ and Sporophyte) Stellar Evolution in Pteridophytes.

UNIT – III **13 Hours**
Gymnosperms: General characteristics and Classification of Gymnosperms (David Bierhorst 1971), *Pinus*: Distribution, Systematic Position, Structure, Reproduction and Lifecycle.

UNIT – IV **14 Hours**
Gnetum: Occurrence, Systematic Position, Structure, Reproduction and Life Cycle of *Gnetum*. (Need not study the Development of Sex Organs and Sporophyte). Economic Importance of Gymnosperms.

UNIT – V **10 Hours**
Paleobotany: Geological Time Scale, Methods of Fossilization; Brief Study of *Rhynia*, *Lepidodendron* and *Lyginopteris*.

PRACTICALS

To make suitable micro preparations of the following.

- Stem T.S - *Lycopodium*, *Selaginella* and *Adiantum* rachis
- T.S: *Pinus* stem and needle, *Gnetum* stem and leaf

To observe and identify specimens and Microslides.

- Psilotum*: Habit, Stem - T.S and Synangium, *Lycopodium* cone L.S.
- Selaginella*: Rhizophore T.S.
- Adiantum*: Habit.
- Pinus*: L.S and Specimen - Male and Female cone

Gnetum: L.S and Specimen - Male, Female cone and ovule
Paleobotany: Stem T.S – *Rhynia*, *Lepidodendron* and *Lyginopteris*
To maintain a record notebook for external evaluation.

REFERENCES

1. Chamberlain, C.J. 2000. Gymnosperms. CBS Publishers and Distributors, New Delhi.
2. Chester A. Arnold. 2017. An Introduction to Paleobotany. Mc Graw Hill Co. Ltd. New Delhi.
3. Pandey, S.N-1995. A text Book of PeridophytaVikas Publishing House, Ghaisibad.
4. Parihar, N.S. 1967. An Introduction to EmbryophytaVol.II- Pteridophyta Central Book Depot. Allahabad.
5. Rashid, A1976. An Introduction to PteridophytaVikas Publishing House Ghaisibad.
6. Shukla, A.C. and Misra, P. 1982. Essentials of Paleobotany, Vikas Publishing House Pvt.LtdGhaisibad.
7. Sing, V, Pande, P.C. and Jain, D.K. 2002. A text Book of Botany – Vol: 4. Pteridophyta, Gymnosperms and Paleobotany. Rastogi Publications. Shivaji Road Meerut-230002.
8. Smith, G.M 1955. Cryptogamic Botany Vol: III Mc Graw Hill Co Ltd. New Delhi.
9. Vashista P.C. 1971. Botany for Degree Students Gymnosperms. Chand and Co New Delhi.
10. Vashista. P.C.1971. Botany for Degree student - Pteridophytes. Chand and Co New Delhi.

<https://www.youtube.com/watch?v=L5Qn9lhI1y0>

<https://www.youtube.com/watch?v=4k9xIMgECVE>

<https://www.youtube.com/watch?v=tc-dllsGZT4>

<https://www.youtube.com/watch?v=mZFhtV2wYYA>

<https://www.youtube.com/watch?v=MxRINmAbAPs>

<https://www.youtube.com/watch?v=zDUCacewuAg>

<https://www.youtube.com/watch?v=QtlcbDWLEDo>

<https://www.youtube.com/watch?v=tumujWmtFj8>

Core course 4 Code: BO4CRT04

**PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY
(Theory 54hrs; Practical 36 hrs; Credits 3+1)**

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To explain the classification, distribution, structure, diversity inhabits, habitats , reproduction and life cycle and organization of Pteridophytes. (<i>Psilotum</i> and <i>Lycopodium</i>)	PO1, PO2	PSO1, PSO2, PSO3	K, C
CO. 2	To impart an insight into the Occurrence, Systematic Position, Structure, Reproduction and Life Cycle of gametophytes.	PO2, PO3	PSO3, PSO4	K, C
CO. 3	To argue about the General characteristics and Classification of Gymnosperms	PO1, PO2	PSO1, PSO2, PSO3	An, Ap
CO. 4	To outline the anatomical variations in Gnetum.	PO3, PO4	PSO4, PSO5, PSO6	K
CO. 5	To infer the significance of Paleobotany and its applications.	PO5	PSO6, PSO7	Ap, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	2	2	2	2	3	3	3	3	3	2
3	3	3	2	2	2	1	3	3	3	3	3	2
4	3	3	2	1	2	1	3	3	3	3	3	2
5	2	3	3	3	2	2	2	3	3	3	3	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
NON - MAJOR ELECTIVE – I(A):GARDENING AND GARDEN MANAGEMENT
(2hrs/week)

Objectives:

- Enable the students to gain knowledge about crop production, plant propagation, plant

L	T	P	C
0	0	2	2

breeding, genetic engineering, preparation of soil biochemistry and simultaneously can work in various fields including floral design, garden centers, teaching, fruit and vegetable production, arboriculture and landscape construction.

06 Hours

Unit – I

Garden: Types – Formal & Informal Garden – English Garden, Mogul Garden, Principles of Ornamental Gardening, Advantage & disadvantages of Formal and Informal Garden.

06 Hours

Unit – II

Propagation Techniques: Soft Wood Cutting – stem, leaf and root, Simple and Air Layering. Pruning Garden

Implements – Digger, Pruning shears, Garden Rake, Patch budding, Whip Grafting.

06 Hours

Unit – III

Components of Ornamental Gardens: Hedges, Edges, Flower Beds, Arches, Rockery, Lawn and

Topiary

06 Hours

Unit – IV

Kitchen Garden: Compost Pits, Layout, Various features of Kitchen Garden, Preparation of Vermicompost and Panchakaviyas.

06 Hours

Unit – V

Indoor Gardening: Principles and Maintenance, Hanging baskets, Terrarium and Bonsai

REFERENCES:

- 1). Fundamentals of Horticulture and Plant Breeding. V. Kumaresan & N. Arumugam, Saras Publication, Nagercoil.
- 2). Horticultural updates; Krispa Shankar, Mohd Talha Ansari Md. Ramjan, Thejangulie Angami Vikashkumar, B.N Hazarika, New Vishal Publications.

<https://www.youtube.com/watch?v=tyhjuZqjNDI>
https://www.youtube.com/watch?v=aRtgOhMgC_c
<https://www.youtube.com/watch?v=USNHQpwCrXw>
<https://www.youtube.com/watch?v=oglc8N-QTm0>
<https://www.youtube.com/watch?v=6Ejq4pbANww>
<https://www.youtube.com/watch?v=uRINsnnUqsl>
<https://www.youtube.com/watch?v=yjTF0FI3lwM>

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
NON - MAJOR ELECTIVE – I (A): GARDENING AND GARDEN MANAGEMENT
(2hrs/week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To study about the types of garden	PO1, PO3	PSO1, PSO2, PSO3	K
CO. 2	To realize the propagation techniques.	PO2	PSO4	C
CO. 3	To revise the components of ornamental gardens	PO1, PO3	PSO6	Ap, K
CO. 4	Application of kitchen garden	PO4, PO5	PSO7	Ap
CO. 5	To apprehend the maintenance of indoor gardening	PO5	PSO5, PSO6, PSO7	Ap

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

GARDENING AND GARDEN MANAGEMENT												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	3	3	2	2	3	3	3	3	2	2
3	3	3	3	3	2	1	3	3	3	2	3	3
4	3	3	3	3	2	1	3	3	3	2	3	3
5	2	3	3	3	2	2	2	3	3	1	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER - III
NON - MAJOR ELECTIVE I - (B)
HERBAL MEDICINE
(2hrs/week)

Objectives:

- To develop skill in identification of medicinal plants.
- To enable the students to understand the medicinal value of some medicinal plants.
- To learn the cultivation and storage methods of medicinal plants.
- To enable the students to understand the conservation methods of medicinal plants.

L	T	P	C
0	0	2	2

Unit – I

8 Hours

Traditional systems of medicine - Siddha, Ayurveda and Homoeopathy. Ethnomedicine with reference to Tamil Nadu. Classification of medicinal plants on the basis of morphology and pharmacology.

Unit – II

7 Hours

Study of the following medicinal plants with special reference to Botanical name, Family, morphology, morphology of the useful part and medicinal uses of *Ginger, Vetiver, Vembu, Kattalai, Saffron, Kattunelli* and *Kasakasa*.

UNIT – III

6 Hours

Study of the following plants with reference to habit, morphology of the useful part and uses:

- 1) *Hemides musindicus* 2) *Justicia adhatoda* 3) *Acalyphaindica* 4) *Andrographis paniculata*
- 5) *Gymnema sylvestre* 6) *Catharanthusroseus* and 7) *Piper nigrum*.

UNIT – IV

5 Hours

Cultivation and methods of storage of *Aloe* and *Catharanthus roseus*. Trading of medicinal plants. Conservation of medicinal plants: *In situ* and *Ex situ* methods.

UNIT – V

4 Hours

Extraction methods and medicinal uses of following volatile oils: Jasmine oil, Sandal wood oil, Clove oil and Lemon grass oil.

PRACTICAL:

1. To identify and to study the medicinal value and the morphology of the useful parts in the plants specified in the syllabus.
2. To identify oils and their medicinal values specified in the syllabus.
3. To maintain a record notebook for external evaluation.

REFERENCES:

1. Gala, D.R. Dhiren Gala & Sanjay Gala. 2000. Nature cure for common diseases, Navneet Publications Ltd., Mumbai.
2. John Jothi Prakash.E. 2003, Medicinal and Aromatic plants. JPR publications, Neyyoor.
3. John Jothi Prakash.E. 2004, Medicinal Botany and Pharmacognosy. JPR publications, Neyyoor.
4. Vaidya Bhagwandush, B. 1999, Herbal cure. Jain publishers, New Delhi.
5. Yoganarasimhan. 2000, Medicinal plants of India, Cyber media, Bangalore.

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<https://www.youtube.com/watch?v=zV9X8IyK9e0>
<https://www.youtube.com/watch?v=xvakf3P3yoA>
<https://www.youtube.com/watch?v=zVMylD7GZ4o>
https://www.youtube.com/watch?v=H_2et6m1AQM

Core course 5 Code: BO5CRT05

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)

SEMESTER - III

NON - MAJOR ELECTIVE I - (B)

HERBAL MEDICINE

(2 hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To discern the traditional medicinal system of Tamil Nadu and classification of medicinal plants based on morphology and pharmacology	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	C
CO. 2	To know and understand the Botanical name, Family, morphology, useful part and medicinal uses of various spices.	PO1, PO2, PO3	PSO2, PSO3	K
CO. 3	To illustrate and articulate the habit, morphology of the useful part and uses of various plants	PO2, PO3	PSO4, PSO5	An, Ap
CO. 4	To transfer knowledge about the Cultivation, Storage and Conservation of medicinal plants	PO4, PO5	PSO5, PSO7	K
CO. 5	To learn and infer about the extraction of medicinal oils	PO5	PSO6, PSO7	K, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

HERBAL MEDICINE												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	3	3	2	2	3	3	3	3	2	2
3	3	2	2	3	2	1	3	3	3	3	2	2
4	3	2	2	3	2	1	3	3	3	3	2	2
5	3	2	1	3	2	2	2	3	3	3	2	1

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
SKILL BASED SUBJECT - I (A)
FLORICULTURE
(4hrs/week)

Objectives:

- The course provides thorough knowledge about the commercial cultivation of flowers and different value added products prepared from it.
- It highlights the potential of these studies to become an entrepreneur.

L	T	P	C
0	0	2	2

UNIT – I **14 Hours**
 Floriculture and its importance, cultivation of Jasmine, Rose, Chrysanthemum and Tulip.

UNIT – II **16 Hours**
 Commercial production and cultivation techniques of Polyanthus, Marigold and Gerbera.

UNIT – III **17 Hours**
 Cultivation techniques of *Anthurium*, **Orchids** and *Heliconia*, cut flower production, importance of cut flower production, package & export.

UNIT – IV **15 Hours**
 Importance of flowers in perfumery, Extraction of Jasmine oil and Rose oil.

UNIT – V **13 Hours**
 Introduction, General Principles of flower arrangement, Western and Japanese flower arrangement, Dry flower decoration.

REFERENCES:

1. Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagarcovil.
2. Kumaresan, V. 2009. Horticulture, Saras Publication, Nagarcovil.
3. Randhawa, G.S. 1973. Ornamental Horticulture in India. Today and Tomorrow Printersand Publishers, New Delhi.
4. Vishnu Swarap, 1997. Garden flowers, National Book Trust, India.

https://www.youtube.com/watch?v=VIINZ1Q_CsY
<https://www.youtube.com/watch?v=RCIkRHKdAbA>
<https://www.youtube.com/watch?v=LfeBAWbL6Ys>
<https://www.youtube.com/watch?v=a4WS0hfK1fI>
https://www.youtube.com/watch?v=_T7HqeaolIg

Core course 6 Code: BO5CRT06
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
SKILL BASED SUBJECT - I (A)
FLORICULTURE

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the importance of floriculture	PO1, PO2	PSO1, PSO2, PSO3	K, C
CO. 2	To appreciate the commercial production of <i>Polyanthus</i> , <i>Marigold</i> and <i>Gerbera</i> .	PO3, PO4	PSO2, PSO3, PSO4	C
CO. 3	To know about the Cultivation techniques of <i>Anthurium</i> , Orchids and <i>Heliconia</i> ,	PO2, PO4	PSO4, PSO5	K
CO. 4	To study the importance of flowers in perfumery, Extraction of Jasmine oil and Rose oil.	PO4, PO5	PSO5, PSO6, PSO7	Ap, An
CO. 5	To comprehend the general principles of flower arrangement in western ways.	PO5	PSO6, PSO7	C

(4hrs / week)

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

FLORICULTURE												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	2	2	3	2	2	3	2	2	3	2	2
2	3	2	2	3	2	2	3	2	2	3	2	2
3	3	2	1	3	2	1	3	2	1	3	2	1
4	3	2	1	3	2	1	3	2	1	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
SKILL BASED SUBJECT –I (B)
PRESERVATION OF FRUITS AND VEGETABLES
(4hrs/week)

Objectives:

L	T	P	C
0	0	2	2

- Inspire regarding the principles of preservation of fruits and vegetables.
- Know the nutritive values, importance and factors affecting storage.
- Understand, methods of preservation of fruits and vegetables and preservation recipes.

UNIT – I **11 Hours**
 Nutritive values of fruits and vegetables; factors affecting storage; spoilage - microbial, enzymatic and insects.

UNIT – II **13 Hours**
 Importance and Methods of Preservation - Refrigeration, Freezing, Canning, Drying and Dehydration, Preservatives – Natural and Chemical.

UNIT – III **13 Hours**
 Methods of preparation of Fruit Juice- Orange, Squashes- grape and Pine apple; Jam - Tomato and Mixed Fruit, Jellies - Guava.

UNIT – IV **11 Hours**
 Preparation of Chutney- Mango, Sauce –Tomato, Pickles- Amla, Mango and Garlic, Ketchup- Tomato. Drying of fruits: Papaya, Grapes and Fig.

UNIT – V **12 Hours**
 Canning of Mango, Cherry, Cucumber, Carrot, Bean and Mushrooms.

REFERENCES:

1. Alex.V and Ramani.2009. Food Chemistry, MPJ Publishers, Chennai.
2. Cruess W.V.1948. Commercial Fruits and Vegetables Products, McGraw Hill Book Company Inc, New York.
3. Girdhari Lal, G.S. Siddappa and G.L.Tandon, 1986, Preservation of Fruits and Vegetables, Indian Council of Agricultural Research, New Delhi.
4. Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil.
5. Kumaresan, V. 2009.Horticulture, Saras Publication, Nagercoil.
6. Usha Rani, C.K. and R. Mary Christi. 2010. Preservation of Fruits and Vegetables, Sheen Grafix, Nagercoil.

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<https://www.youtube.com/watch?v=f141C9Kw3jo>
https://www.youtube.com/watch?v=XKvo9_Jdt4

Core course 7Code: BO5CRT07
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
SKILL BASED SUBJECT – I(B)
PRESERVATION OF FRUITS AND VEGETABLES
(4hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	Acquire basic knowledge about the nutritive values of fruits and vegetables	PO1, PO2	PSO1, PSO2	K
CO. 2	Familiarize with the basic skills in the methods of Preservation.	PO2, PO3	PSO3, PSO4, PSO5	Ap
CO. 3	Understand the Methods of preparation of Fruit Juice.	PO3, PO4	PSO5, PSO7	C
CO. 4	Understand the Preparation of Chutney, Ketchup and Drying of fruits.	PO3, PO4, PO5	PSO5, PSO6	K, C
CO. 5	To know about the canning methods.	PO5	PSO6, PSO7	K

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

PRESERVATION OF FRUITS AND VEGETABLES												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	2	2	2	2
2	3	3	3	3	2	2	3	3	2	2	2	2
3	3	3	3	3	2	1	3	3	2	1	2	1
4	3	3	3	3	2	1	3	3	2	1	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
NON – MAJOR ELECTIVES II - (A) FOOD AND NUTRITION
(2hrs/week)

Objectives

Preamble: Facilitates understanding of the principles of food and nutrition. It provides the student to understand the nutritive values, importance, factors affecting storage and methods of preservation of food which make the students aware of application of different plants in various industries.

L	T	P	C
0	0	2	2

UNIT – I

06 Hours

Food: Major Classes of Food – Carbohydrates, Proteins, Fats and Oils, Vitamins, Minerals – Energy value of food. Balanced Diet – Functions and deficiency Symptoms – Causes and Prevention.

UNIT – II

06 Hours

Plants as Source of Food: Nutritive Value of Cereals and Millets (Rice, Wheat, Maize, Sorghum, and Ragi); Pulses (Bengal gram, Black gram, Green gram, Red gram and Peas); Nuts and Oil seeds (Ground nuts, Sesame, Coconut, Soyabeans, Sunflower); Fruits and Vegetables (Mango, Banana, Guava, Pomegranate, Grapes, Cucumber, Brinjal, Ladies finger, Tomato, Carrot)

UNIT – III

06 Hours

Food Preservation: Importance of Preservation, Methods of Preservation. Low and High Temperatures, Uses of Oil and Spices, Use of Salt and Sugar. Preparation of Jam, Jelly, Pickles and Squashes.

UNIT – IV

06 Hours

Food Additives: Definition and Types; Food Poisoning - Salmonellosis, Botulism; Food Adulteration -Harmful Effects, Simple Physical Tests for Detection of Food Adulterants

UNIT – V

06 Hours

Fermentations and Beverages: Fermentation Types, Classification and Uses,

REFERENCES:

1. Basics of Food & Nutrition Mrs. Neeta baijal, Dr. Lalita Sharma Star publications.
2. Hand book of Food and Nutrition Dr. M. S. Swaminathan.
<https://www.youtube.com/watch?v=Wlq7H1xAoNc>
<https://www.youtube.com/watch?v=sE6ABn7qbmY>
<https://www.youtube.com/watch?v=zDzB5adcrKI>
https://www.youtube.com/watch?v=l0BthUI_MMA
<https://www.youtube.com/watch?v=PJF2BSmbFbM>

Core course 8 Code: BO5CRT08
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
NON – MAJOR ELECTIVES II - (A) FOOD AND NUTRITION
(2hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the energy value of food and balanced diet.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K
CO. 2	To make the students aware about the nutritive value of cereals, nuts and oil seeds.	PO2, PO3, PO4	PSO PSO2, PSO3, PSO4	K, C
CO. 3	To help students to design novel mechanisms for the sustainable utilization of naturalresources.	PO2, PO3, PO4	PSO3, PSO4, PSO5	An, Ap
CO. 4	To study about the importance of preservationand uses of oil and spices.	PO3, PO4	PSO5, PSO6	K, Ap
CO. 5	To make the students aware about food poisoning.	PO3, PO4	PSO6, PSO7	K
CO. 6	To know about the fermentation types.	PO5	PSO6, PSO7	K

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

FOOD AND NUTRITION												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	
1	3	3	2	2	2	2	3	3	3	2	2	2
2	3	3	2	1	2	2	3	3	3	2	1	2
3	3	3	2	1	2	1	3	3	3	2	1	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
NON-MAJOR ELECTIVES II - (B)
BOTANY FOR COMPETITIVE EXAMINATION
(2hrs / week)

Objectives:

- The basic Principles of Botany to the students which are vital role for facing competitive examinations.

L	T	P	C
0	0	2	2

UNIT – I

06 Hours

Basics of the Plant Kingdom: Brief Classification of Plant Kingdom; Diagnostic features of Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperms, Bacteria, Viruses, Economic importance of these groups.

UNIT – II

06 Hours

Basics of Angiosperm Taxonomy: A brief account of Natural systems of classification (Bentham and Hooker's system) and Phylogenetic system of classification (Engler and Prantl's system) Binomial Nomenclature. A Brief account of the following Families and their Economic Importance – Fabaceae, Cucurbitaceae, Poaceae.

UNIT – III

06 Hours

Medicinal Importance: *Zingiber officinale*, *Vetiveria zizanioides*, *Ocimum sanctum*, *Azadirachta indica*, *Solanum trilobatum*, *Phyllanthus emblica*, *Andrographis paniculata* and *Acalypha indica*.

UNIT – IV

06 Hours

Basics of Plant physiology: Basics of Absorption of Water, Transpiration, Photosynthesis, Respiration, Protein synthesis.

UNIT – V

06 Hours

Cell Organelles: Tissues and Tissue systems; An Introduction to Genetics - Mendelism, Monohybrid cross and Dihybrid Cross. **Genetic Engineering:** Enzymes used in Gene Cloning experiments. An introduction to Plant Tissue culture; Biofertilizers.

REFERENCES

- Bhattacharya, Hait, Ghosh. 2014. A Text Book of Botany-(Volume:2),
- New Central Book Agency (P) Ltd, Kolkata.
- Pandey S.N, Misra, S.P, Trivedi, P.S- 2012. A Text Book of Botany – Vikas Publishing House Pvt Ltd, Noida
- Soni, N.K and Vandana soni-2010 Fundamentals of Botany (Volume 1,2,3) Tata Mc Graw Hill Education Private Limited, New Delhi
- Wallis, T.E. 2005 Text Book of Pharmacognosy C B S Publishers, New Delhi.
- Yoganarasimhan.2000 Medicinal Plants of India Cyber media, Bangalore.

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<https://www.youtube.com/watch?v=30pYa0-ppJI>
<https://www.youtube.com/watch?v=Kt0Lgy17I78>
<https://www.youtube.com/watch?v=EoUjXl4W2us>
<https://www.youtube.com/watch?v=M-qDzKG3RB0>

Core course 8 Code: BO5CRT08
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – IV
NON-MAJOR ELECTIVES II - (B)
BOTANY FOR COMPETITIVE EXAMINATION
(2hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO.1	To make the students to understand the plant kingdom.	PO1, PO2	PSO1, PSO2, PSO3	K, C
CO.2	To study the Basics of Angiosperm Taxonomy.	PO1, PO2	PSO1, PSO2, PSO4	K
CO.3	To help the student to study the medicinal values of local plants.	PO3, PO4	PSO5, PSO6, PSO7	An, Ap
CO.4	To study about the basics of plant physiology.	PO1, PO2	PSO1, PSO2, PSO3, PSO4	K
CO.5	To create awareness to the students to understand in Tissue systems, Genetics, Genetic Engineering and Plant Tissue culture.	PO4, PO5	PSO6, PSO7	K, C

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

BOTANY FOR COMPETITIVE EXAMINATION												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	3	3	2	2	3	3	3	3	2	2
3	3	3	3	3	2	1	3	3	3	3	2	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
CORE PAPER–V: CELL BIOLOGY AND EMBRYOLOGY OF ANGIOSPERMS
(5 HRS/WEEK)

Objectives:

- The structure of prokaryotic and eukaryotic cells including cell organelles and their function, and cell division.
- The complete details about the flower, sporogenesis, pollination, development of gametophytes, fertilization, embryogeny and other post-fertilization events, and apomixis.

L	T	P	C
0	0	2	2

UNIT – I **15 Hours**
 Structure of Prokaryotic and Eukaryotic cells, Cell cycle, Amitosis, Mitosis, and Meiosis

UNIT – II **15 Hours**
 Ultrastructure of cell organelles and function: Nucleus, Chloroplast, Mitochondria, Endoplasmic reticulum, Golgi complex, and Ribosomes

UNIT – III **15 Hours**
 Morphological nature of Flower, Anther types and Structure, Microsporogenesis, Pollengrain structure, Ovule types, Megasporogenesis and Male Gametophyte Development, Female Gametophyte Development and its types

UNIT – IV **15 Hours**
 Pollination, Pollen-pistil Interaction, Self-incompatibility, Double Fertilization, Post fertilization changes, Endosperm Development and types, Embryogeny in Dicots and Monocots and Structure of Dicot and Monocot embryos

UNIT – V **15 Hours**
 Seed and Fruit Development, Parthenocarpy, Polyembryony, Apomixis, Basic concepts of Apogamy and Apospory, Agamospermy and Parthenogenesis

PRACTICAL:

Cell Biology

1. Study of Mitosis in the Onion root tip
2. Electro-micrographs of Cell organelles and Non-living Inclusions

Embryology of Angiosperms

1. Dissect and display the parts of a flower
2. Identification of anther types with the slides and photographs
3. Identification of ovules types with the slides and photographs
4. Dissect out anyone stage of embryo
5. Developmental stages of embryo photographs

To maintain a record notebook for external evaluation.

REFERENCES:

1. Batgina T.B., 2002. Embryology of Flowering Plants.Terminology and Concepts. Vol. 1.Generative Organs of Flower. Oxford & IBH.
2. Batgina T.B., 2005. Embryology of Flowering Plants.Terminology and Concepts. Vol. 2.Seed.CRC Press.
3. Batgina T.B.2009. Embryology of Flowering Plants.Terminology and Concepts.Vol 3. Reproductive Systems.CRC Press.
4. Bhojwani S.S., Bhatnagar S.P., Dantu P.K., 2018. The Embryology of Angiosperms.6th Ed. Vikas Publishing House Pvt. Ltd.
5. Gerald Karp. 2013. Cell Biology. 7th ed. Wiley.
6. Janet Iwasa and Wallace Marshall. 2018. Karp's Cell Biology. 8th Global Ed. John Wiley& Sons.
7. Johri B.M., 2011. Embryology of Angiosperms. Springer Softcover Reprint of the Original 1984.1sted.
8. Maheswari, P. (Panchanan). 2015. An Introduction to the Embryology of Angiosperms. Scholar Select.
9. VirendraBatra. 2009. Plant Cell Biology. Oxford Book Company.
10. William V. Dashek., Marcia Harrison. 2006. Plant Cell Biology. 1st ed. CRC Press.

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<https://www.youtube.com/watch?v=IA0DhWDTUpU>

https://www.youtube.com/watch?v=ExuNJ_dKQaM

<https://www.youtube.com/watch?v=gwykLmOsw6k>

<https://www.youtube.com/watch?v=i3BgMvJR07E>

Core course 8 Code: BO5CRT08
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
CORE PAPER–V: CELL BIOLOGY AND EMBRYOLOGY OF ANGIOSPERMS
(5 HRS/WEEK)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To study the structure of Prokaryotic and Eukaryotic cells.	PO1, PO2	PSO1, PSO2, PSO3	K
CO. 2	To understand the ultrastructure of cell organelles and function.	PO1, PO2, PO3	PSO1, PSO2, PSO3	C
CO. 3	To help the students to study the Morphological nature of Flower.	PO2, PO4	PSO1, PSO2, PSO3	K, C
CO. 4	To aid the students to understand how the zygote is formed in plants.	PO1, PO2, PO3	PSO4, PSO5, PSO6	K
CO. 5	To make the students to understand about the Seed and Fruit Development.	PO4, PO5	PSO6, PSO7	K

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

CELL BIOLOGY AND EMBRYOLOGY OF ANGIOSPERMS												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	2	2	3	3	2	2	3	2	2	3	2	2
2	2	2	3	3	2	2	3	2	2	3	2	2
3	2	1	3	3	2	1	3	2	1	3	2	1
4	2	1	3	3	2	1	3	2	1	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
CORE PAPER – VI: MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS
(5hrs / week)

Objectives:

L	T	P	C
0	0	2	2

- Understand the principles of systematics.
- Describe the distinctive features of selected families.
- Identify and preserve the plant species.
- Know the economic value of the plants in the cited families

UNIT – I

15 Hours

Modifications: Root, stem and leaf; Phyllotaxy - types; Inflorescence: Racemose, Cymose, Mixed and Special types. Description of floral parts; Fruit - types.

UNIT – II

15 Hours

Systems of classification of plants: Natural - Bentham and Hooker system Phylogenetic – Engler and Prantl's system - (with merits and demerits); Plant Nomenclature – Binomial Nomenclature and author citation, ICBN; Herbarium - techniques and importance.

UNIT – III

15 Hours

Detailed study of the following families and their economic importance: Nymphaeaceae, Anonaceae, Rutaceae, Caesalpiniaceae, Cucurbitaceae and Apiaceae.

UNIT – IV

15 Hours

Rubiaceae, Sapotaceae, Convolvulaceae, Asclepiadaceae and Lamiaceae.

UNIT – V

15 Hours

Amaranthaceae, Euphorbiaceae, Liliaceae, Arecaceae and Poaceae.

PRACTICAL:

1. Morphological identification of plant parts and their modifications.
2. Technical description of plant parts and dissection of floral parts of plants with reference to the families prescribed in the syllabus.
3. Field trips (minimum 2days) to places under the guidance of teachers to study plants in their natural habitat and submit a report.
4. Identify and comment on the useful plant parts or plants prescribed in the syllabus.
5. Preparation and submission of 10 herbarium sheets.
6. To maintain a record notebook for external evaluation.

REFERENCES:

1. Ashok Bendre and Ashok Kumar (1984) – A Text Book of Practical Botany – Vol. II. Rastogi Publications, Shivaji Road, Meerut.
2. Davis P. H. and Heywood V.H. (1993) – Principles of Angiosperms Taxonomy.
3. Lawrence, G.H.M (1953) – Taxonomy of Vascular Plants, Oxford & IBH Publishes, New Delhi.
4. The flora of the Tamilnadu Carnatic / K.M. Matthew. Tiruchirapalli, India: Rapinat Herbarium, St. Josephs College, 1983. 3 v. (lxxxiv, 2154 p.).
5. Taxonomy of angiosperms. V N Naik. Publisher: New Delhi: Tata McGraw-Hill, ©1984.
6. Narayanaswamy, R.V & Rao, K. N (1976) – Outlines of Botany, S. Viswanathan Printers & Publishers, Madras.
7. Singh, G. 2005. Plant Systematics – Theory and Practice. Oxford & IBH, New Delhi.
8. Singh, V & Singh, D.K (1983) – Taxonomy of Angiosperms, Rastogi Publications,
9. Vashista, P.C (1997) – Taxonomy of Angiosperms, S. Chand & Co., (P) Ltd., New Delhi.
10. Verma, V (1974) – A Text Book of Economic Botany, Emkay Publications, New Delhi.

https://www.youtube.com/watch?v=1K_G4UXc3s0

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Core course 8 Code: BO5CRT08
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
CORE PAPER – VI: MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS
(5hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To study the morphological modifications in plants.	PO1, PO2	PSO1, PSO2, PSO3	K
CO. 2	To help the students to understand the Systems of classification of plants.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K, C
CO. 3	To understand the detailed study of the following families and their economic importance: Nymphaeaceae, Annonaceae, Rutaceae, Caesalpiniaceae, Cucurbitaceae and Apiaceae.	PO1, PO2, PO3	PSO1, PSO2, PSO3	K, C
CO. 4	To study about the detailed study of the following families and their economic importance Rubiaceae, Sapotaceae, Convolvulaceae, Asclepiadaceae and Lamiaceae.	PO2, PO3, PO4, PO5	PSO3, PSO4, PSO	K, C
CO. 5	To make the students to understand detailed study of the following families and their economic importance Amaranthaceae, Euphorbiaceae, Liliaceae, Arecaceae and Poaceae.	PO2, PO3, PO4, PO5	PSO3, PSO4	Ap, An

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation.
Mapping

MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	3	3	2	2	3	3	3	3	2	2
3	3	3	3	3	2	1	3	3	3	3	2	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
CORE PAPER–VII: BIOCHEMISTRY AND BIOINFORMATICS
(5hrs / week)

Objectives:

- To enable the students to understand
- The fundamentals of Biochemistry and Bioinformatics.
- The structure of various biomolecules.
- To develop skill in detection and estimation of biomolecules in plant tissue.
- To develop skill in e-mail and internet, Library Information system and Virtual Reality.
- To become aware of the importance of computer applications in life sciences.

L	T	P	C
0	0	2	2

UNIT – I

15 Hours

Brief account of atom. Bonds - Ionic, Covalent and Hydrogen bonds. Principles and uses of pH meter, Colorimeter, Centrifuge and Chromatography.

UNIT – II

14 Hours

Carbohydrates: Basic structure and properties of Monosaccharides - Glucose and Fructose Disaccharides - Sucrose and Maltose. Polysaccharides - Cellulose and Starch.

UNIT – III

15 Hours

Proteins: Primary, Secondary and Tertiary structure and properties of proteins. Lipids: Classification, Basic structure and properties of lipids.

UNIT – IV

15 Hours

Enzymes: Classification, Nomenclature, Mechanism of enzyme action - Lock and Key hypothesis, Role of enzymes in food industry.

UNIT – V

18 Hours

Introduction to Bioinformatics, Basic components of computer, Internet and Browsing Websites. Virtual library, Online literature, Nucleic acid sequence data bases, Protein sequence data bases and Enzyme data bases.

PRACTICAL:

1. Measurement of pH of a solution using pH meter.
2. Determination of complementary colour.
3. Verification of Beer's Law.
4. Estimation of starch in plant tissues by colorimetry.
5. Estimation of proteins in plant tissues by colorimetry.
6. Separation of dyes from a mixture by Circular paper chromatography.

Spotters:

Instruments: pH meter, Colorimeter, Centrifuge, Keyboard, CPU and Pen drive.

Chemicals: Glucose, Sucrose, Starch.

Charts: Mechanism of Enzyme action - Lock and key model & Induced fit model.

To maintain a record notebook for external evaluation.

REFERENCES:

1. Conn. E.J. and Stumpf. P.K., 1987, outlines of Biochemistry, Wiley Eastern Ltd., Bombay.
2. Jain. J.L., 2001, Fundamentals of Biochemistry, S.Chand and Co., New Delhi.
3. Lehninger. A.L., 1987, Biochemistry, CBS Publishers, New Delhi.
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5. Attwood. T.K. and Parry. S., 1999, Introduction to Bioinformatics, Addison Wesley Longman Ltd.

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<https://www.youtube.com/watch?v=ozdO1mLXBQE>

<https://www.youtube.com/watch?v=5BBYBRWzsLA>

https://www.youtube.com/watch?v=w-uk-_TOgR0

Core course 8 Code: BO5CRT08
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
CORE PAPER – VII: BIOCHEMISTRY AND BIOINFORMATICS
(5hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO.1	To make the students aware about the basic chemical structure and basic instruments.	PO1, PO2	PSO1, PSO2, PSO3	K
CO.2	To study the structure and properties of carbohydrates.	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K
CO.3	To help the students to understand the properties of proteins	PO2, PO3	PSO1, PSO2	K, C
CO.4	To study about the basics of enzyme function and its application.	PO1, PO2, PO3	PSO1, PSO2, PSO6	K
CO.5	To make the student's familiar with the bioinformatics tool and data bases for screening big data corresponding to the living organisms and its applications in genetic diversity, heredity and forensics. Also in the modeling of macromolecules and drug designs strategies.	PO2, PO3, PO4, PO5	PSO1, PSO5, PSO6	K, An

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis ; E: Evaluation

Mapping

BIOCHEMISTRY AND BIOINFORMATICS												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	2	3	2	3	2	3	3	3	2	2
2	3	3	2	3	2	3	2	3	3	3	3	2
3	3	3	2	3	2	3	2	3	3	3	3	2
4	3	3	3	3	2	1	3	3	3	3	3	2
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
ELECTIVE I (A) - PLANT ECOLOGY AND PHYTOGEOGRAPHY
(5hrs/week)

L	T	P	C
0	0	2	2

Preamble: To enable the students to understand biotic and abiotic factors in our ecosystem, to study the need of various ecosystems and vegetation. This course will enable the students to understand how environment influence the life of different organisms and vice versa.

UNIT – I **14 Hours**

Vegetation: Biotic and abiotic factors and their influence on vegetation, a brief account of microbes, plants, animals, soil, wind, light, temperature, rainfall and fire. Biogeochemical cycles – Nitrogen and Carbon.

UNIT – II **16Hours**

Ecosystem: Concept, processes and component: Types of ecosystems – Aquatic and Forest: Ecological Classification of Plants: Morphological, anatomical and physiological adaptations of plants with special reference to Hydrophytes and Xerophytes

UNIT – III **17Hours**

Autecology and Synecology: Definition (Species, Population, Community); Vegetation – Units of vegetation – Formation, Association, Consociation; Society – development of vegetation; Migration – ecesis, colonization; Methods of study of vegetation – Quadrat

UNIT – IV **15Hours**

Biomonitoring and Biodegradation: Xenobiotics using microbe, Types of Bioremediation – in situ and ex situ, phytoremediation, Biosensors and Bioindicators.

UNIT – V **13 Hours**

Phytogeography: Principles, continental drift and endemism. Vegetation in Tamil Nadu, Remote Sensing, Climate and climatic regions of India

PRACTICAL:

1. Analysis of herbaceous vegetation by using quadrat and line transect method to find out frequency, density, abundance and interpret the vegetation in terms of Raunkaier's frequency formula.
2. Morphological and anatomical adaptations of hydrophytes and xerophytes(each2)
Hydrophytes: Hydrilla, Nymphaea
Xerophytes: Nerium, Casuarina
3. Continental drift, Remote sensing, Vegetation in Tamil Nadu.
4. To maintain a record notebook for external evaluation.

REFERENCES:

1. A Text book of plant Ecology. 15th Edition R.S. Ambasth & N.K. Ambasth. C.B.S Publishers & distributors Pvt. Ltd.
2. Daubenmier, R.F. (1970), Plants and Environmental. A text book of Plant Autoecology, Wiley Eastern Private Limited
3. Daubenmier, R.F. (1970), Plant Communities, Wiley Eastern Private Limited.
4. Odum, E. (2008). Ecology, Oxford and IBH Publisher.
5. Plant Ecology, E.D Schulze E. Beck, K. Muller – Hohenstein, Springer.
6. Sharma P.D (2010) Ecology and Environment, (8th Ed.) Rastogi Publications, Meerut.
7. Kormondy, E.J. (1996). Concepts of Ecology, Prentice Hall, U.S.A 4th edition.
8. Singh, J.S, Singh, S.P. and Gupta, S. (2006). Ecology Environment and Resource Conservation. Anaamaya Publications, New Delhi.
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<https://www.youtube.com/watch?v=1LuvE8dYUjg>

<https://www.youtube.com/watch?v=6jgCsYEiVNA>

<https://www.youtube.com/watch?v=ZY8jz1dkFg8>

<https://www.youtube.com/watch?v=mc1V733uOho>

Core course 8 Code: BO5CRT08
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
ELECTIVE I (A) - PLANT ECOLOGY AND PHYTOGEOGRAPHY
(5hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To enable the students to understand biotic and abiotic factors in various ecosystems and vegetation.	PO1, PO2	PSO1, PSO2, PSO3, PSO4	K
CO. 2	To study the concept and types of ecosystem and adaptations	PO1, PO2, PO4	PSO1, PSO6, PSO7	K
CO. 3	To help the students to analyze the vegetation by quadrant method	PO2, PO4	PSO1, PSO2, PSO5, PSO6	An
CO. 4	To study about the Biosensors and Bio indicators.	PO2, PO4, PO5	PSO1, PSO2, PSO3	K, C
CO. 5	Make the students to understand the principles of continental drift and endemism and to know about the vegetation in Tamil Nadu and uses of Remote Sensing.	PO2, PO4, PO5	PSO6, PSO7	An, Ap

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis ; E: Evaluation

Mapping

PLANT ECOLOGY AND PHYTOGEOGRAPHY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	2	3	3	2	2	3	3	3	2	2	2
2	3	2	3	3	2	2	3	3	3	2	2	2
3	3	2	3	3	2	1	3	3	3	2	2	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
ELECTIVE PAPER – I (B): MARINE BIOTECHNOLOGY
(5hrs / week)

Objectives:

- To enable the students to have a broad knowledge about the marine environment.
- Phytoplanktons and their importance in the sea.
- Economic importance of organisms in the marine environment.
- Value of SCP and mass cultivation of algae.
- Pollution aspects and conservation methods.

L	T	P	C
0	0	2	2

UNIT – I

13 Hours

Physical and Chemical properties of sea water
, zonation, characteristics and adaptation of planktonic, benthic and pelagic life.

UNIT – II

16 Hours

Phytoplankton: characteristics, different groups, methods of floatation, algal bloom, toxins, Red tide, factors regulating phytoplankton, production and measurement, methods of collection and preservation.

UNIT – III

13 Hours

Marine flora and its potential role in research, antibiotics, vitamins, confectionaries, food, dyes and agar agar.

UNIT – IV

15 Hours

Laboratory and mass culture of algae, single cell protein - Spirulina, sea weed cultivation.

UNIT – V

18 Hours

Marine pollution: pollution due to heavy metals, radioactive wastes, thermal and oils, possible remedies - oil eating bacteria - GMO, conservation of coastal ecosystem with special reference to coral reefs and mangrooves.

PRACTICAL:

1. Determination of pH.
2. Determination of acidity.
3. Determination of alkalinity.
4. Determination of salinity.
5. Measurement of dissolved O₂ content.
6. Collection and identification of phytoplanktons.
7. To maintain a record notebook for external evaluation.

Reference:

1. Clark, R.B.2001, Marine Pollution, published by Oxford University Press, USA.
2. Sharma, B.K. and Kaur.H.1994, water pollution, Krishna Prakashasn Media, Meerut, U.P.
3. Sharma, B.K. and Kaur.H.1994, Thermal and radioactive pollution. Krishna Prakashasn Media, Meerut, U.P.

<https://www.youtube.com/watch?v=kqAB4aylt0A>
<https://www.youtube.com/watch?v=U734grD0xpQ>
https://www.youtube.com/watch?v=z_DdIcGOEGl
<https://www.youtube.com/watch?v=kTfT4VHjr2M>
<https://www.youtube.com/watch?v=Sp572udnPVg>
<https://www.youtube.com/watch?v=PGLTSRAjtPI>

Open course 2 Code: BO5OPT02
MSU / 2021 - 2022 UG – Colleges / Part - III (B.Sc. Botany)
SEMESTER – V
ELECTIVE PAPER – I (B): MARINE BIOTECHNOLOGY
(5hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the importance of benthic and lotic ecosystem and its life forms.	PO1, PO2	PSO1, PSO2, PSO3, PSO4	K
CO. 2	To expertize the production, cultivation and value addition of phytoplanktons and its applications.	PO3, PO4, PO5	PSO2, PSO3, PSO5, PSO7	K, C
CO. 3	To understand and infer the impact of marine flora.	PO2, PO4, PO5	PSO1, PSO2, PSO3	Ap
CO. 4	To understand the basic concepts of sea weed cultivation.	PO1, PO2, PO5	PSO1, PSO2, PSO3	K
CO. 5	To make the students to understand the things that affect the marine water and also about the conservation of coastal ecosystem especially mangroves.	PO2, PO4, PO5	PSO1, PSO2, PSO3, PSO6	E, An

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

MARINE BIOTECHNOLOGY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	2	2	3	2	2	3	3	3	2	2	2
2	3	2	1	3	2	2	3	3	3	2	1	2
3	3	2	1	3	2	1	3	3	3	2	1	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
CORE PAPER–VIII - GENETICS, EVOLUTION AND BIOSTATISTICS
(5 hrs / week)

Objectives:

- To learn the pattern of inheritance.
- To understand the mechanism of gene action.
- To learn the concept of Biostatistics.
- To become aware of the importance of statistical tools in life sciences.

L	T	P	C
0	0	2	2

UNIT – I

16 Hours

Mendel's laws of heredity with reference to Monohybrid and Dihybrid crosses. Test cross - Monohybrid and Dihybrid. Incomplete dominance - Monohybrid and Dihybrid. Lethal gene action in Maize and Mice.

UNIT – II

14 Hours

Interaction of genes; Supplementary genes, Complementary genes and Duplicate factors. Polygenic inheritance with reference to ear length in corn. Linkage, crossing over and recombination

UNIT – III

15 Hours

Molecular structure of DNA, Replication of DNA - Semi conservative method, Proof for DNA as genetic material, Genetic code, Sex determination in plants.

UNIT – V

13 Hours

Evolutionary theories - Lamarckism, Darwinism, Mutation theory of Devries. Chemosynthetic theories – evidence any five; modern synthetic theory of evolution, speciation.

UNIT – V

17 Hours

Collection and interpretation of data, Mean, Median, Mode, Standard deviation & Chi-square test.

PRACTICAL:

1. To work out simple genetic problem in Monohybrid, Dihybrid, Incomplete dominance, Lethal genes and Interaction of genes.
2. Using available data to find out the Mean and Standard deviation and to draw frequency curve / histogram.
3. To work out simple Chi-square problems.
4. To record variation: Intra / Inter specific.
5. Spotters: Models and Charts: DNA structure, Replication of DNA, use and disuse theory of Lamarck, Natural selection theory - Struggle for existence.

To maintain a record notebook for external evaluation.

REFERENCES:

1. Gupta. P.K., 1991, Genetics, Rastogi Publications, Meerut.
2. Gupta. P.K., 2004, Cell and Molecular Biology, Rastogi Publications, Meerut.
3. John Jothi Prakash. E. and David Paulraj M., 2007, Genetics and Biostatistics, JPR Publications, Neyyor.
4. Verma. P.S. and Agarwal. V.L., 1991, Genetics, S.Chand and Co., NewDelhi.

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<https://www.youtube.com/watch?v=YJHGfbW5510>

<https://www.youtube.com/watch?v=6NiCeKP0wwU>

https://www.youtube.com/watch?v=o_-6JXLYS-k

<https://www.youtube.com/watch?v=TNKWgcFPHqw>

Core course 9 Code: BO6CRT09
MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
CORE PAPER–VIII - GENETICS, EVOLUTION AND BIOSTATISTICS
(5 hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To impart an insight into the principles of heredity and the mendelian concepts.	PO1, PO2, PO4	PSO1, PSO2, PSO3	An, C
CO. 2	To understand the patterns of inheritance in different organisms and the modes of linkages and crossing over.	PO1, PO2, PO4	PSO, PSO2, PSO3, PSO4	K
CO. 3	To study about the basics of genetic material and their expression in the determination of sex and other characteristics.	PO2, PO4, PO5	PSO1, PSO2, PSO3, PSO4	K
CO. 4	To contrast and relate the theory of evolution and its applications.	PO4, PO5	PSO6	Ap, An
CO. 5	To develop skills in biostatistics and its applications.	PO3, PO4, PO5	PSO3, PSO4	S, An

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

GENETICS, EVOLUTION AND BIOSTATISTICS												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	2	2	3	3	2	2	3	3	2	2	2
2	3	2	1	3	3	2	1	3	3	2	1	2
3	3	2	1	3	3	2	1	3	3	2	1	1
4	3	2	2	3	3	2	2	3	3	2	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
CORE PAPER – IX: PLANT PHYSIOLOGY
(5hrs / week)

Objectives:

- Understand the various functions of the plants.
- Know the mechanisms of the various activities.
- Relates the role of phytohormones on growth and development of plants.

L	T	P	C
0	0	2	2

UNIT – I

17 Hours

Water Relations: Imbibition, Diffusion, Osmosis and Plasmolysis; Water Potential- Definition, Components, Absorption of Water –Mechanism and Factors affecting Water Absorption; Transpiration- Definition, Types, Significance and Mechanism of Stomatal Transpiration- steps and theories, Guttation

UNIT – II

17 Hours

Ascent of Sap –Definition, Path of Ascent of Sap, Mechanism- Transpiration Pull and Cohesion Theory; Mineral nutrition: Macro and Micro-nutrients - Absorption of Mineral Salts – Mechanism; Translocation of Organic Solutes: Mechanism - Munch’s Mass flow hypothesis.

UNIT – III

17 Hours

Photosynthesis: Light and Dark Reactions - Photosynthetic Electron Transport Chain and Photophosphorylation (Cyclic and Non cyclic); Carbon Assimilation - C₃, and C₄ Pathways and its Significance; Respiration: Types, Glycolysis, Krebs’s cycle and Oxidative Phosphorylation.

UNIT – IV

12 Hours

Growth Curve and phases of growth; Phytohormones: Physiological Effects and Practical applications - Auxin, Gibberellic acid, Cytokinin, Ethylene and Abscisic acid.

UNIT – V

12 Hours

Seed dormancy: Causes and Methods of breaking seed dormancy; Photoperiodism and Vernalization.

PRACTICAL:

1. Water Potential by Falling Drop Method.
2. Osmotic Potential by Plasmolytic Method.
3. Rate of Photosynthesis in Different Concentrations of Bi-Carbonate – Bubble Method.
4. Determination of Respiratory Quotient (R.Q) using Ganong’s Respirometer.
5. Effect of Temperature on Permeability of Plasma Membrane.
6. Separation of Chlorophyll Pigments by Ascending Paper Chromatography.

DEMONSTRATION:

1. Tissue Tension; 2. Suction due to Transpiration; 3. Fermentation; 4. Arc Auxanometer; 5. Clinostat; 6. Phototropism

Spotters

1. Absorption Spectrum of Chlorophylls
2. Growth curve.
3. Growth hormone

To maintain a record notebook for external evaluation.

REFERENCES:

1. Devlin, R.M. (1969). Plant Physiology. Holt, Rinehart & Winston & Affiliated East West Press (P) Ltd., New Delhi.
2. Dulsy Fatima, R.P. et al., (1994). Elements of Biochemistry. Saras Publications, Nagercoil, Tamil Nadu.
3. Jain, V.K. (1990). Fundamentals of Plant Physiology. S. Chand & Co., New Delhi. Noggle, R. and Fritz (1989). Introductory Plant Physiology. Prentice Hall of India. Pandey, S.N. (1991). Plant Physiology. Vikas Publishing House (P) Ltd., New Delhi.
4. Periyasamy, K. (1978). Cell Iyakka Viyal (Cell Physiology). Tamil Nadu text Book Society, Chennai.
5. Salisbury, F.B. and Ross, C.W. (1999). Plant Physiology. CBS Publishers and Printers, New Delhi.

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<https://www.youtube.com/watch?v=5jJLfwTkGe8>

<https://www.youtube.com/watch?v=S8XhuNlqbHQ>

<https://www.youtube.com/watch?v=zWO-bTi6u8M>

<https://www.youtube.com/watch?v=QRE9HAXgN4g>

Core course 10 Code: BO6CRT10
MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
CORE PAPER – IX: PLANT PHYSIOLOGY
(5hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the relationship between water and plant cells.	PO1, PO2	PSO1, PSO2, PSO3, PSO4	C
CO. 2	To transport water and food materials throughout the body of the plant.	PO1, PO2	PSO1, PSO2, PSO3	C
CO. 3	To study about the various pathways for training to the photosynthetic activity and respiration.	PO3, PO4, PO5	PSO1, PSO2, PSO3, PSO4, PSO5, PSO6	K, An
CO. 4	To understand in detail about the growth of the plant and the influence of plant growth regulators on its growth.	PO2, PO3, PO4	PSO1, PSO2, PSO4, PSO5, PSO6	An, Ap
CO. 5	To know about the sea dormancy its application and photo periodic effects.	PO2, PO4	PSO1, PSO2, PSO3, PSO4, PSO5, PSO6	K, C

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

PLANT PHYSIOLOGY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	2	3	3	3	2	3	3	3	2	2
2	3	3	2	3	3	3	2	3	3	3	2	2
3	3	3	2	3	3	3	2	3	3	3	2	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER – VI
CORE PAPER – X: MICROBIOLOGY
(4 Hrs / Week)

Objectives:

- The paper aims to impart knowledge of Bacteriology and Virology including classification, structure, multiplication, transmission, food borne pathogens, water borne pathogens and microbial control.
- The paper aims to give the students broad theoretical knowledge in industrial microbiology and agricultural microbiology.

L	T	P	C
0	0	2	2

12 Hours

UNIT – I

Brief History and Development of Microbiology, classification of Microorganisms (Whittaker's five kingdom concept), Bacteria- outline of Bacterial classification (Bergey's manual); Ultra-structure, nutritional types and reproduction of Bacteria, Media preparation and Pure culture Techniques of Bacteria; staining Technique- Gram staining.

12 Hours

UNIT – II

Viruses: General characteristics, structure and reproduction of TMV, T₄ bacteriophages, Viroids, Virions, Prions; Transmission and control measures of plant viruses, Isolation and purification of Viruses.

12 Hours

UNIT – III

Microbes in Food production, spoilage, poisoning and preservation – Bacterial Flora in Milk, Pasteurization of Milk and milk products; Bacterial pathogens and water pollution; Drinking water as a vehicle of Diseases; purification of water.

12 Hours

UNIT – IV

Methods of Direct Gene Transfer – Ultra sonication, Electroporation, Liposome Mediated Gene transfer. Microscopy – Principles and Applications of Phase Contrast, Fluorescence, Polarization; Camera Lucida.

12 Hours

UNIT – V

Identification of Recombinants – Insertional inactivation, Immunochemical Method and colony Hybridization Technique, Selection of Recombinant using selective medium and reporter genes. Blotting Techniques – Southern, Northern and Western Blotting.

PRACTICAL

1. Preparation of Culture Media for Bacteria.
2. Demonstration of preparation of serial dilution and isolation of pure culture from soil.
3. Procedure for gram staining and identify the type of bacteria
4. Demonstration of analysis of milk – Methylene Blue Dye Reduction Test.

5. Spotters:

- i. Ultra structure of bacterial cell wall \
- ii. T₄^{Phage}
- iii. HIV Virus
- iv. Autoclave
- v. Laminar Air Flow Chamber
- vi. Hot Air Oven
- vii. Inoculation needle
- viii. Agar medium
- ix. Streak Plate Method
- x. Spoiled food
- xi. Liposome mediated gene transfer in plants
- xii. Colony hybridization technique
- xiii. Blotting technique – Southern, Northern and Western Blotting

To maintain a record notebook for external evaluation.

REFERENCES:

1. Ananthanarayan R and Jayaram Paniker CK (2020). Textbook of Microbiology, Eleventh Edition. Universities Press (India) Pvt. Ltd.
2. Aneja K.R (2017). Fundamental Agricultural Microbiology. New Age International Private Limited.
3. Dubey RC and Maheshwari DK. (2010). A Textbook of Microbiology S Chand Publications.
4. Casida LEJR. (2019). Industrial Microbiology Paperback. New Age International Private Limited.
5. Pelczar MJ. Chan Noel ECS and Krieg R. (1986). Microbiology Hardcover, 5th edition. McGraw-Hill Inc., US.
6. Rangaswami G and Bagyaraj DJ. Agricultural Microbiology. 2nd Edition. Phi Learning.
7. BabuNarendra G, Girisham S, Reddy SM and Reddy B. Vijaypal. (2017). Applied Microbiology. Scientific Publishers.
8. William C. Frazier, Dennis C. Westhoff, Vanitha, N.M. (2017). Food Microbiology, 5th Edition. McGraw Hill Education.

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Core course 11 Code: BO6CRT11
MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER – VI
CORE PAPER – X: MICROBIOLOGY
(4 Hrs / Week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To understand the history of microbiology bacterial classification culture of bacteria and its predictive techniques.	PO1, PO2, PO4	PSO1, PSO2, PSO3, PSO4	C
CO. 2	To study about virus, virions prions and why rights and their diseases in plants.	PO1, PO2, PO4	PSO5, PSO6	K
CO. 3	To know about the importance of microbes in food as well as their pathogenic effects	PO3	PSO1, PSO2, PSO3, PSO5, PSO6	K, Ap
CO. 4	To realize the need for gene transfer and its mechanism; also to know about different microscopy and its techniques.	PO4, PO5	PSO2, PSO3, PSO4	An, E
CO. 5	To know about identification of recombinants marker systems and blotting techniques.	PO2, PO4, PO5	PSO3, PSO4, PSO5, PSO6	K, E

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis ; E: Evaluation

Mapping

MICROBIOLOGY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	3	3	2	2	3	3	3	3	2	2
3	3	3	3	3	2	1	3	3	3	3	2	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER – 1 (A): HORTICULTURE & PLANT BREEDING
(4hrs/week)

Objectives:

- Develop skills in horticultural practices and techniques.
- Learn to construct kitchen garden and ornamental gardens.
- Gain a knowledge of the techniques of producing desirable plants through hybridization

L	T	P	C
0	0	2	2

UNIT – I

12 Hours

Scope, importance and divisions of horticulture; Gardening: Definition and objectives – different types of gardening – Formal, informal and kitchen garden.

UNIT – II

14 Hours

Propagation methods: Cutting – root, stem and leaf; Layering – ground and air layering, grafting – tongue and approach grafting; Budding – T budding and Patch budding; Vegetative propagules - bulb, sucker, corm. Seed Propagation: Preparation of Nursery beds, Transplantation – steps and Methods.

UNIT – III

12 Hours

Garden components: Lawn, Hedges, Edges, Rockery, Topiary, water garden, Bonsai and Hanging basket. Garden implements - spade, water can, pruning scissors, digging fork

UNIT – IV

11 Hours

Nature, Scope and Objectives of Plant Breeding; Plant introduction- selection methods (pure line and mass), Hybridization techniques, Heterosis breeding, Interspecific and intergeneric hybridization.

UNIT – V

11 Hours

Mutation Breeding: Procedure and practices, Mutagens, Polyploidy breeding and its applications. Breeding for disease resistance.

PRACTICALS:

- i. Vegetative methods of propagation.
 - a. Cutting-Stem and Leaf cutting
 - b. Layering-Simple and air layering.
 - c. Grafting - Tongue grafting.
 - d. Budding - T-budding.
- ii. Garden components -Rockery, hanging baskets, and topiary.
- iii. Garden implements - spade, water can, pruning scissors, digging fork
- iv. Designing Kitchen Garden.
- v. Plant Breeding: Emasculation and Bagging methods.

To maintain a record notebook for external evaluation.

REFERENCES:

1. Allard, R.W. (1960). Principles of Plant Breeding. John Wiley & Sons, New York.
2. Bose, T.K., Maiti, R.G., Dhua, R.S. and Das, P. (1999). Floriculture and Landscaping. Naya Prakash, Calcutta.
3. Chopra, V.L. (1989). Plant Breeding. Oxford IBH, New Delhi.
4. Kumar, N. (1997). Introduction to Horticulture. Rajalakshmi Publication, India.
- Manibhushan Rao, K. (1991). Text Book of Horticulture. MacMillan Publications, New Delhi.
5. Mukherjee, D. (1972). Gardening in India. Oxford & IBH Publishing Co., Kolkatta, Mumbai, New Delhi.
6. Roy Choudhry, N. and Mishra, H.P. (2001). Text book on Floriculture and Landscaping. Raja Info Tech Enterprise, India.
7. Sharma, J.R. (1994). Principles and Practice of Plant Breeding. Tata McGraw Hill, New Delhi.

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<https://www.youtube.com/watch?v=ACaeM8djkCQ>

Core course 11 Code: BO6CRT11
MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER – 1 (A): HORTICULTURE & PLANT BREEDING
(4hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To know about the different types of horticulture and its uses.	PO1, PO2	PSO1, PSO2, PSO3, PSO4	K
CO. 2	To understand different propagation techniques and its steps and procedure.	PO1, PO2, PO4	PS1, PSO2, PSO3, PSO4, PSO5	C
CO. 3	To learn and work with the different garden tools and components	PO1, PO2, PO4	PSO2, PSO4, PSO5, PSO6	K
CO. 4	To Realize and revitalize the hybridization techniques both in theory and practical	PO3, PO4, PO5	PSO2, PSO4, PSO5, PSO6	E, An
CO. 5	To apply mutation in the breeding of plants and to create various resistant varieties	PO3, PO4, PO5	PSO2, PSO4, PSO5, PSO6	Ap

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

HORTICULTURE & PLANT BREEDING												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	2	2	3	2	2	3	3	2	2	2	2
2	3	2	1	3	2	2	3	3	2	1	2	2
3	3	2	1	3	2	1	3	3	2	1	2	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER – I (B) :FORESTRY
(4hrs/week)

Objectives:

1. To aware the knowledge of Forest
2. To learn about forest, forest Products and utilization and valuable Forest Products.

L	T	P	C
0	0	2	2

UNIT – I

12 Hours

Forests - Introduction, physiography, vegetation, Forest types, Role of forests-distribution and classification. (Champion and Seth's Classification) Forest as balanced ecosystem, status of Indian Forests-Indian Forest policy.

UNIT – II

10 Hours

Forest degradation – Damage caused by fire, climatic factors, and injuries by insects, plants, animals and diseases, activities of man including encroachment and shifting cultivation.

UNIT – III

12 Hours

Forest management and Conservation-Regeneration Tending Operations – Sustainable utilization forest resources – Forest organizations. Role of remote Sensing in Forest management.

UNIT – IV

12 Hours

Agro Forestry – objectives – advantages and disadvantages. Recreational forestry – role of botanical gardens, zoos, National Parks and sanctuaries.

UNIT – V

12 Hours

Forest utilization – Harvesting, conservation, storage and Disposal of wood in Forest; major and minor Forest Products; Forest based Industries_ Paper and pulp industry; resin tapping and turpentine manufacture; Forest education in India.

PRACTICAL

1. Identify and find out the uses of wood samples of common timbers
2. Prepare maps showing forest types in India and Tamil Nadu.
3. Collect and study the remote sensing images showing forest vegetation in India and Tamil Nadu.
4. Prepare Photographs of different forest types.
5. Study the commonly used important forest Products.
6. To maintain a record notebook for external evaluation.

REFERENCES

1. Agarwal – Forest in India
2. Bore, N.C – Manual of Indian Forest Botany
3. DWivedi, A.P – Forestry in India.
4. Sagreiya, K.P – Forest and Forestry

5. Tribhawan Metha- A Hand book of Forest utilization.

<https://www.youtube.com/watch?v=Z8jOcYEtyc0>

https://www.youtube.com/watch?v=xIOibiAC_s

<https://www.youtube.com/watch?v=PH1Bt8gipKI>

<https://www.youtube.com/watch?v=jLZ0KtNx354>

Core course 11 Code: BO6CRT11
MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER – I (B): FORESTRY
(4hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To know about the forest ecosystem its classification and Indian forest policy	PO1, PO2, PO4	PSO1, PSO2, PSO3, PSO4	K
CO. 2	To Know about the degradation of forest and its solution	PO2, PO4, PO5	PSO1, PSO2, PSO3, PSO4	K
CO. 3	To study about the classical and modern forest management techniques	PO2, PO4	PSO1, PSO2, PSO3, PSO4, PSO6	K, C
CO. 4	To realize the need for agro forestry and recreational forestry	PO2, PO4, PO5	PSO1, PSO2, PSO4, PSO6	An
CO. 5	To critically analyze the various uses of forest and its manipulation for the betterment of the human kind	PO2, PO4, PO5	PSO1, PSO2, PSO4, PSO6	E, An

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

FORESTRY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	2	2	3	2	2	3	3	3	2	2	2
2	3	2	1	3	2	2	3	3	2	2	1	2
3	3	2	1	3	2	1	3	3	2	1	1	1
4	3	3	3	3	2	1	3	3	2	1	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER – II (A):
PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING
(4hrs/week)

Objectives:

L	T	P	C
0	0	2	2

This paper helps the students to understand the totipotency of the cells and the tissue culture techniques, to learn the fundamental principles in gene cloning, various methods of gene transfer, screening and the use of vectors in gene transfer technology for the desired characteristics.

UNIT – I

14 Hours

Tissue culture: Introduction, definition, history, scope and importance of plant tissue culture, Totipotency of cells, Tissue culture laboratory - organization and requirements, sterilization techniques, Nutrient media-composition and preparation. Apical meristem culture, callus culture, Embryo culture, Anther culture.

UNIT – II

15 Hours

Protoplast culture: Protoplast isolation, culture and fusion, selection of hybrids and regeneration. Cybrids- production and applications. Artificial Seed - production, advantages and disadvantages. Tissue culture application including micropropagation, androgenesis, production of virus free plants, Secondary metabolite production, germplasm conservation, cryopreservation and usages.

UNIT – III

15 Hours

Enzymes and Vectors for Genetic Manipulations: Restriction endonuclease - types, biological role, mechanism and usage in cloning; Restriction Mapping - linear and circular; Ligase enzymes. Cloning vectors -basic sequence of any vector; types of bacterial vector - Ti plasmid, pBR 322, BAC; Viral vector - Lambda page, phagemid, cosmid and Yeast vector.

UNIT – IV

16 Hours

Gene Cloning and Methods of Gene transfer: Basic concept of Gene cloning, advantages of gene cloning, bacterial transformation methods and selection of recombinant clones using various strategies, PCR-mediated gene cloning; Gene Construct; Plant transformation vector, T-DNA and viral vector, Agrobacterium-mediated Transformation protocols, molecular mechanism of T-DNA transfer, direct gene transfer method by Electroporation, Microinjection, Micro projectile bombardment.

UNIT – V

15 Hours

Major concerns and Applications of Transgenic Technology: Transgenic technology and sustainable agriculture, Biosafety concerns with transgenic technology. Applications as Pest resistant (BT-cotton); herbicide resistant plants (Roundup Ready Soybean); Transgenic crops with improved quality traits in major crops (FlavrSavr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug)

PRACTICAL: Spotters / Photographs

1. Callus culture from Carrot explant, apical meristem culture, embryo culture and anther culture
2. Protoplast Isolation
3. Plasmids-Ti plasmids
4. Gene cloning in *E. coli*
5. Agrobacterium mediated gene transfer
6. Direct gene transfer by electroporation, microinjection, micro projectile bombardment
7. Transgenic plants prescribed in the syllabus.
8. To maintain a record notebook for external evaluation.

REFERENCES

1. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
2. Chrispeels, M.J. and Sadava, D.E. (1994). Plants, Genes and Agriculture. Jones & Barlett Publishers.
3. Glick, B.R., Pasternak, J.I. (2003). Molecular Biotechnology-Principles and Applications of recombinant DNA. ASM Press. Washington.
4. Santosh. N., and A. Madhavi. (2010). Practical Book of Biotechnology and Plant Tissue Culture. S. Chand &Co.
5. Slater A., N.W.Scott and M.R. Fowler (2008). Plant Biotechnology. Second Edition. Oxford.
6. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K.
7. Steward, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.

<https://www.youtube.com/watch?v=xuwV3ywCxW8>

<https://www.youtube.com/watch?v=utlKKvqxbWw>

<https://www.youtube.com/watch?v=iJTj8Y65Qlo>

<https://www.youtube.com/watch?v=hqs57VsSk7s>

https://www.youtube.com/watch?v=D5aEKiez_nw

<https://www.youtube.com/watch?v=fo2dI4leUfY>

Core course 11 Code: BO6CRT11
MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER – II (A):
PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING
(4hrs/week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO.1	To study about the various techniques pertaining to the plant tissue culture	PO1, PO2, PO3	PSO1, PSO2, PSO3, PSO4	K
CO.2	Understand the various applications of plant tissue culture in the production of hybrids as well as its aid in the preservation of indigenous species	PO3, PO4, PO5	PSO1, PSO2, PSO3, PSO4	C
CO.3	To know about the various enzymes and vectors used in the genetic engineering techniques	PO3, PO4	PSO1, PSO2, PSO3, PSO4	K
CO.4	To know about the various techniques involved in gene cloning and the use of polymerized chain reaction.	PO2, PO4, PO5	PSO2, PSO3, PSO5, PSO6	K
CO.5	To relate and criticize the different applications of GMOs and few of its examples	PO4, PO5, PO6	PSO2, PSO3, PSO5, PSO6	E, An

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis ; E: Evaluation

Mapping

PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	2	2	2	3	2	2	3	2	2
2	3	3	3	2	2	2	3	2	3	2	2	2
3	3	3	3	2	1	1	3	2	3	2	2	1
4	3	3	3	2	1	1	3	2	3	2	1	1
5	2	3	3	3	2	2	2	3	3	2	1	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER - II (B):
ENVIRONMENTAL BIOTECHNOLOGY
(4hrs / week)

Objectives:

- To enable the students to understand and how to tackling environmental problems.
- To enable the students to understand the morphological, anatomical and physiological adaptations of hydrophytes, xerophytes and halophytes.
- To develop skills in identification of different forest types of Tamil Nadu.

L	T	P	C
0	0	2	2

UNIT – I

13 Hours

Aims and scope of environmental biotechnology. Environmental spheres - Hydrosphere, Geosphere, Biosphere and Anthrosphere. Pollution measurement - Biotechnological methods for measurement of pollution. Role of Biosensors in pollution monitoring.

UNIT – II

14 Hours

Biofuels: Biogas - production of biogas, uses of biogas, Hydrogen production - microbial production of hydrogen, uses of hydrogen. Petroleum plants: *Calotropis procera*, *Euphorbia tirucalli*, *Jatropha curcas*.

UNIT – III

10 Hours

Sewage treatment - Primary, secondary and tertiary treatment, water recycling, soil conservation and restoration. Sustainable agricultural management.

UNIT – IV

12 Hours

Solid waste treatment and disposal, Biodegradation of hydrocarbons, pesticides and herbicides. Bioremediation: Types of Bioremediation, Genetically Engineered microorganisms in Bioremediation. Phytoremediation, Biosensors.

UNIT – V

11 Hours

Greenhouse effect, Global warming, Ozone depletion and Acid rain - Causes, effects and control measures. Remote sensing and its applications in ecology.

PRACTICAL:

Photographs / model: Biogas plant, Biosensor, Sewage treatment, Acid rain, and Greenhouse effect.

Spotters: Petro plants, *Calotropis procera*, *Euphorbia tirucalli* and *Jatropha curcas*

To maintain a record notebook for external evaluation.

REFERENCES

1. Mishra. D.D.2008. Fundamental concepts in Environmental Studies. S. Chand and Company Ltd., New Delhi.

2. Saha. T.K. 2008. Ecology and Environmental Biology. Books and Allied (P) Ltd., Kolkatta.
3. Shukla. R.S., and Chandel. P.S. 2007. A text book of plant Ecology, S. Chand and Company Ltd., New Delhi.
4. Singh. H.R. Environmental Biology. S. Chand and Company Ltd, New Delhi.
5. Vijaya Ramesh. K. 2004. Environmental Microbiology, MJP Publishers, Chennai.

<https://www.youtube.com/watch?v=GxwmuXqhJqE>

<https://www.youtube.com/watch?v=NZRJtS6xopc>

<https://www.youtube.com/watch?v=8J7yL9Tfijo>

<https://www.youtube.com/watch?v=foXhallITPQ>

<https://www.youtube.com/watch?v=XHi7kV-ZMT0>

https://www.youtube.com/watch?v=d7Ci_EooW-k

<https://www.youtube.com/watch?v=Nf8cuvl62Vc>

Core course 11 Code: BO6CRT11
MSU / 2021 - 2022 UG – Colleges / Part – III (B.Sc. Botany)
SEMESTER - VI
ELECTIVE PAPER - II (B):
ENVIRONMENTAL BIOTECHNOLOGY
(4hrs / week)

CO. NO	Description	PO Addressed	PSO Addressed	CL
CO. 1	To know about the aim and scope of environmental technology and application of biotechnological methods to bio remediate the present environment	PO1, PO2, PO3, PO4	PSO1, PSO2, PSO3, PSO4	K, C
CO. 2	To know and understand in detail about the biofuels and its production	PO2, PO3	PSO1, PSO2, PSO3, PSO4	K, C
CO. 3	To evaluate the successful treatment of sewage through biotechnology.	PO2, PO4, PO5	PSO1, PSO2, PSO3, PSO4	E
CO. 4	To study about the solid waste treatment and in detail about bioremediation.	PO1, PO4, PO5	PSO2, PSO3, PSO5, PSO6	K
CO. 5	To know in detail about the greenhouse effects and remote sensing techniques.	PO1, PO4, PO5	PSO2, PSO3, PSO5, PSO6	K

K: Knowledge; C: Comprehension; Ap: Application; An: Analysis; S: Synthesis; E: Evaluation

Mapping

ENVIRONMENTAL BIOTECHNOLOGY												
CO/PO/PSO	PO					PSO						
	1	2	3	4	5	1	2	3	4	5	6	7
1	3	3	3	3	2	2	3	3	3	3	2	2
2	3	3	3	3	2	2	3	3	3	3	2	2
3	3	3	3	3	2	1	3	3	3	3	2	1
4	3	3	3	3	2	1	3	3	3	3	2	1
5	2	3	3	3	2	2	2	3	3	3	2	2

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)